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A CONSIDERATION OF THE URINARY DISTANCE AS A DIAGNOSTIC FACTOR IN PROSTATIC HYPERTROPHY.[1]

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To state that one of the features of prostatic enlargement is an increase in the urethral length is to enunciate a self-evident proposition; yet the matter, simple as it seems, has acquired weight in my eyes in connection with the study of a certain important case in which men in high standing were deceived in their diagnosis by failing to investigate this point.

Mr. X. eighteen months ago came to me from a Western city, referred by a very capable surgeon, who announced in his letter that the case was one of "enormous prostate filling up the entire pelvis."

The patient, a refined gentleman aged sixty-two years, a lawyer by profession, showing fatigue and age in his face, but not cachexia, had been using a catheter for ten years, more or less. His expulsive urinary force was feeble, and a month before seeing me, after a chilling, he had suffered from absolute retention for many days and been obliged to rely entirely upon the catheter.

When he saw me he had regained the power of spontaneous micturition, but the urine was moderately purulent, with a trace of blood; the bladder only held about four ounces, of which two and a half ounces was a residuum requiring the catheter for its evacuation. Naturally the local tenderness was considerable, and the calls to urinate frequent by day and night.

[1] Read before the American Association of Genito-Urinary Surgeons at West Point, June 9, 1898.

I passed a finger into the rectum and found no bulging of the prostate. The organ, on the contrary, seemed unusually flat, but my finger could not define any upper border. A hard, flat, absolutely dense, non-lobulated condition, not hot or throbbing, commenced in the prostate and extended indefinitely upward—entirely beyond the tip of the exploring finger. Here, then, was the "enormous prostate entirely filling up the pelvis." But why, with such a size, was there no bulging downward of the lateral lobes into the rectum?

I next passed a catheter, and found the urinary distance to be exactly eight inches. I subsequently passed a full-sized steel sound of ordinary curve. It slipped in as if going through a youthful urethra, encountering no resistance, and a finger in the rectum appreciated that the prostatic substance between itself and the sound was quite thin. Bimanual palpation failed to reveal any large pelvic tumor, and finally the ordinary tube of the cystoscope went in without obstruction, was reversed with ease, and disclosed a couple of clover-leafed livid areas extending inward from the vesical neck on either side toward the trigonum, rising centrally outward toward what appeared to be a very small third lobe.

My diagnosis was, therefore, "very small prostate, with moderate third lobe and considerable inflammatory thickening of the trigonum, making it impossible with the finger in the rectum to appreciate the upper limits of the prostate."

This impossibility to map out the upper limits of the prostatic lobes is so uncommon, except in cases of cancer, for the existence of which I could find no sufficient evidence, that it gave an especial interest to the case.

Before going home, the patient desiring another opinion, I sent him to one of the most competent of the many distinguished general surgeons which New York possesses, and the latter wrote to me that he found a "considerably hypertrophied prostate with probably a middle lobe enlargement." He suggested orchidectomy, and told me afterward that he considered the prostate to be "very large."

I may terminate the case by stating that I confirmed my therapeutic suggestions to local means directed against the surface catarrh of the prostate and bladder, together with a course of life to better the general health, and the patient returned to me in ten months much improved in every respect, comfortable in his intervals of emptying the bladder and not getting up at all at night, his urine perfectly clear except the first gush, which contained a few shreds. His urinary distance was still exactly eight inches, but now the finger could easily map out the upper border of the prostate and demonstrate that organ to be unusually flat and small.

In response to a letter a few weeks since, I learn that the conditions to-day are satisfactory. There is still a residuum of two to three ounces, and the catheter is used once a day to perform the vesical toilet, but the general health is excellent, the urinary intervals long, and the patient is effusive in his expressions of gratification at his condition.

The result of this case, I think, carries its own comment. In contemplating the obvious deductions from the data just given, it seemed easy to formulate a rule of action, the normal urethra being consid-

ered, in a general way, to be eight inches long; but before attempting this, I determined to satisfy myself as to the general limits of the healthy urethra by making some personal measurements. These have been carried out during the past three months upon office patients by myself, Dr. Charles Chetwood, my associate, and my son, Dr. E. L. Keyes, Jr. They include twelve prostatics and sixty-two other individuals with various maladies of the urethra not involving an increase in length, and include a few absolutely healthy canals. I have tabulated the results, and have been surprised to note the wide variations that exist—while the normal mean continues to turn out very nearly what we have supposed it to be.

Before considering these measurements taken during life, it is proper to consult a number of special writers and of anatomists who have taken their testimony from the dead and from the living urethra.[1] But when one approaches the subject from this stand-point, he is immediately confronted by a wide divergence of opinion, showing differences much greater than those disclosed by my investigations upon the living subject.

Littré and Ch. Robin[2] give the urethral length in adults and old men as varying from 13 to 19 centimetres, averaging 16 centimetres or 6.4 inches.

Todd's *Cyclopædia*[3] quotes Ducamp as stating that the urethra rarely exceeds 9 inches. Whatley (48 cases) makes the average 8½ inches; Lisfranc (12 cases) 9 to 10 inches—in a negro 12 inches. Petrequin says the estimated length is from 5½ to 12 inches, but his own measurements upon the living subject made it 5¾ to 6½ for straight, and 6¼ to 7 inches for curved instruments; Briggs (60 cases, living), 6¾ to 8½ inches.

Bouilly[4] quotes Ducamp, Whatley, and Amussat as averaging 22½ centimetres, 9 inches; Meckel and Rougie, 26 centimetres, 10.4 inches; Sabatier, J. Cloquet, and Lisfranc, 30 centimetres, 12 inches; Boyer averages 30 centimetres, 12 inches; while, as more accurate observations taken from the dead subject, he gives: Richet, 15 centimetres, 6 inches; Sappey, 16 centimetres, 6.4 inches; Malgaigne, 15½ centimetres, 6.2 inches.

Bouilly, therefore, agrees with Guyon that accuracy in stating the urethral length is impossible, but that 16 centimetres, 6.4 inches, is about right.

Sappey,[5] from post-mortem examinations upon 54 normal urethras, puts the average length at 13.3 centimetres, 5½ inches, with a normal increase in age due to normal prostatic and bulbous hypertrophy of

[1] Dr. E. L. Keyes, Jr., has collected the references for me.
[2] Art. Dict. de Méd., 1873, p. 1622.
[3] Todd's Cyclopædia, 1849–52, Part II., vol. iv. p. 1244.
[4] Nouveau. Dict. de Méd. et de Chir. Prat., 1885, vol. xxxvii. p. 124.
[5] Traité d'Anatomie Descriptive, 1879, vol. iv. p. 667 (Guyon).

one centimetre, $\frac{2}{5}$ inch, the maximum noted being 23.3 centimetres, $9\frac{1}{3}$ inches, supposed to be a normal canal.

Malgaigne, according to Guyon, makes the length 15.5 centimetres, $6\frac{1}{2}$ inches. Guyon[1] states that measurements are so variable as to be useless.

Gray,[2] "its length varies from 8 to 9 inches."

Woolsey,[3] "the length of the urethra averages $8\frac{1}{2}$ inches in the dead subject, $7\frac{1}{2}$ to $7\frac{3}{4}$ inches in the living."

Taylor,[4] "the average length of the urethra is from 7 to $8\frac{1}{2}$ inches, but it may be shorter or longer."

Gould,[5] "it is from 8 to 9 inches long."

Treves,[6] "the male urethra is about $8\frac{1}{2}$ inches in length (21 centimetres)."

McClellan,[7] "the male urethra is 20 centimetres, or about 8 inches, in length."

Ledwich,[8] "the urethra is divided into three portions: prostatic, membranous, and spongy, the first being $1\frac{1}{4}$ inches, the second from $\frac{1}{4}$ to $\frac{3}{4}$ of an inch; the remainder of the canal, which is from 9 to $10\frac{1}{2}$ inches in length, is formed by the corpus spongiosum urethra," thus making the average $11\frac{1}{2}$ inches, about, as the text reads.

Jamain,[9] "the length of the canal is from 20 to 27 centimetres," average $23\frac{1}{2}$ centimetres or $9\frac{6}{10}$ inches.

Ellis,[10] "the urethra has an average length of about $8\frac{1}{2}$ inches."

J. William White[11] agrees with Gray.

Güterbock[12] quotes Henle in putting the urethral length at $8\frac{2}{10}$ inches.

Curale[13] thinks that the length of the penis and that of the urethra have no relation to each other. He quotes Phillips in giving the average length as $8\frac{1}{2}$ inches, while he himself[14] makes the average about 6 inches.

Reybard quotes Velpeau, making average $6\frac{1}{2}$ inches.

Leroy d'Etiolles, quoted by Henry Smith,[15] thinks that fat men have relatively longer urethras. He puts the mean length at 8 inches.

Reybard[16] says that the canal is an inch and a half longer on the living than on the dead subject, while Sir Henry Thompson,[17] measuring sixteen dead urethras and finding the average $8\frac{1}{2}$ inches, and quoting Briggs, who found in the living $7\frac{5}{8}$, and whose method he

[1] Leçons Cliniques, 1896, vol. ii. p. 307.
[2] Anatomy, American edition, 1887, p. 959.
[3] Morrow's System of Genito-urinary Diseases and Syphilis, vol. i. p. 31.
[4] Venereal Diseases, 1895, p. 35.
[5] Illus. Dict. of Med., 1896, p. 1575.
[6] Surgical Applied Anatomy, 1895, p. 402.
[7] Regional Anatomy, 1892, p. 135.
[8] Human Anatomy, 1852, p. 425.
[9] Anatomie Descriptive, 1853, p. 581.
[10] Demonstrations of Anatomy, 1861, p. 638.
[11] White and Martin. Genito-urinary and Venereal Diseases, p. 47.
[12] Die chirurgischen Krankheiten der Harn und mannlichen Geschlechtsorgane, 1890, Bd. i. p. 3.
[13] Maladies des Org. Genito-urinaires, vol. i. p. 28.
[14] Loc. cit., p. 29.
[15] Stricture of the Urethra, 1857, p. 3.
[16] Canal de l'Urethre, 1855, p. 5.
[17] Stricture of the Urethra, 1858, p. 3.

tested and approved, concludes that the urethra on the cadaver is longer than in the living subject.

In order to accentuate by a bird's-eye view the differences of opinion of these various authorities, I have condensed their views into the following table. To intensify the confusion, it may be noted that Malgaigne as quoted by Bouilly makes the average length $6\frac{2}{10}$ inches, as quoted by Guyon $6\frac{5}{10}$ inches.

	Inches.
Littré and Ch. Robin, average length	$6\frac{4}{10}$
Todd's Cyclopædia	$7\frac{1}{10}$
Ducamp, Whatley, Amussat	9
Meckel and Rougier	$10\frac{4}{10}$
Sabatier, Cloquet, Lisfranc	12
Boyer	12
Richet	6
Malgaigne, quoted by Bouilly	$6\frac{2}{10}$
Bouilly	$6\frac{4}{10}$
Sappey	$5\frac{5}{10}$
Malgaigne, quoted by Guyon	$6\frac{5}{10}$
Gray	$8\frac{5}{10}$
Woolsey	8
Taylor, about	$7\frac{6}{10}$
Gould	$8\frac{5}{10}$
Treves	$8\frac{5}{10}$
McClellan	8
Ledwich	$11\frac{5}{10}$
Jamain	$9\frac{6}{10}$
Ellis	$8\frac{5}{10}$
White	$8\frac{5}{10}$
Henle (Güterbock)	$8\frac{2}{10}$
Sir Henry Thompson	$8\frac{5}{10}$
Phillips	$8\frac{1}{2}$
Curale	6
Velpeau (Reybard)	$6\frac{1}{2}$
Briggs	$7\frac{5}{8}$
Leroy d'Etiolles	8
Average	$8\frac{1}{7}$

Thus it seems that, although there are wide differences of individual opinion as to the urethral length, yet the average comes around to about the conventional estimate of 8 inches or a shade over.

To return to my personal investigations upon the living, I may say that my measurements were made with the subjects standing up. A soft, red-rubber catheter was used, marked in quarter inches, and the point noted at which the urine ceased and again started to flow, while the well-lubricated catheter was being gently pushed in and again drawn out, the bladder being distended with five ounces of fluid.

URINARY DISTANCE—NORMAL URETHRA.

Case.	Name.	Malady.	Age.	Tall: 5 ft. 10 in.+ Medium: 5 ft. 6 in. to 5 ft. 10 in. Short: Under 5 ft. 6 in.	Length of penis in inches.	Residual urine.	Urinary distance.
1	F.	Urethritis	27	Short	4¼	.....	6¾
2	B.	After perineal section	27	.....	.....	.....	7
3	R.	Posterior urethritis	32	Short	3¾	.....	7
4	W.	None	29	.....	.....	.....	7¼
5	I.	Prostatitis	52	.....	.....	.....	7⅓
6	F.	Stricture	44	.....	.....	.....	7⅓
7	C.	Urethritis	26	Medium	5½	.....	7⅓
8	R.	Stricture	35	.....	.....	.....	7⅓
9	T.	Posterior urethritis	27	Short	4¾	.....	7⅓
10	H.	Locomotor ataxia	34	.....	.....	℥ss.	7½
11	F.	Posterior urethritis	26	Medium	4	.....	7⅔
12	H.	None	26	Tall	5¼	.....	7⅔
13	W.	Urethritis	21	Short	5	.....	7⅞
14	R.	Stricture	25	.....	.....	.....	7¾
15	J.	Tubercular cystitis	29	.....	.....	.....	7¾
16	W.	None	29	.....	.....	.....	7¾
17	S.	Stricture	46	.....	.....	.....	7¾
18	E.	Tubercular cystitis	50	.....	.....	.....	7¾
19	N.	Urethritis	25	.....	.....	.....	7¾
20	K.	Urethritis	32	.....	.....	.....	7⅞
21	S.	None	33	Medium	6¼	.....	8
22	A.	Urethritis	24	.....	.....	.....	8
23	P.	Prostatic neuralgia	32	Tall	6¾	.....	8
24	H.	Urethritis	35	.....	.....	.....	8
25	E.	Urethritis	26	Short	3½	.....	8
26	H.	Urethritis	32	.....	.....	.....	8
27	B.	Urethritis	30	Medium	5½	.....	8
28	F.	Urethritis	30	.....	.....	.....	8
29	S.	Stricture	30	.....	.....	.....	8
30	L.	Posterior urethritis	34	.....	.....	.....	8
31	F.	Urethritis	29	Short	5½	.....	8
32	S.	Urethritis	24	Tall	6	.....	8
33	H.	Urethritis	22	Medium	5½	.....	8
34	C.	Urethritis	25	Tall	6½	.....	8
35	R.	Urethritis	32	.....	.....	.....	8
36	S.	Urethritis	25	.....	.....	.....	8
37	N.	Urethritis	35	.....	.....	.....	8
38	F.	Urethritis	48	.....	.....	.....	8
39	L.	None	25	.....	.....	.....	3
40	T.	Urethritis	33	Short	5½	.....	8
41	D.	Urethritis	27	.....	.....	.....	8
42	F.	Urethritis	24	Short	5¼	.....	8
43	B.	Tubercular cystitis	36	.....	.....	℥iij.	8
44	I.	Posterior urethritis	26	Short	3½	.....	8
45	E.	Prostatic neuralgia	37	Medium	4¾	.....	8
46	F.	Posterior urethritis	24	Short	5½	.....	8
47	A.	Posterior urethritis	32	.....	.....	.....	8¼
48	B.	Urethritis	40	.....	.....	.....	8¼
49	B.	None	32	.....	.....	.....	8¼
50	B.	Tubercular cystitis	36	Medium	4¾	.....	8¼
51	F.	None	55	Medium	6	.....	8¼
52	T.	Locomotor ataxia	44	Medium	4	.....	8⅓
53	K.	None	43	Tall	6	.....	8⅓
54	W.	Posterior urethritis	24	Tall	6¼	.....	8⅓
55	S.	Urethritis	24	.....	.....	.....	8⅓
56	McL.	None	39	.....	.....	.....	8⅓
57	McM.	Urethritis	39	.....	.....	.....	8⅓
58	B.	None	50	Short	6½	.....	8⅓
59	S.	Posterior urethritis	46	Short	5	.....	8⅓
60	G.	None	35	Medium	4¾	.....	8¾
61	S.	Urethritis	23	.....	.....	.....	9
62	W.	None	42	Tall	5¼	.....	9½
		Average, about	...	.....	.....	.....	8

At first I paid no attention to the size of the individual or the length of his penis, but as I went on I seemed to recognize irregularities possi-

bly due to one or both of these factors. Therefore, in all the last measurements the size of the individual was taken as well as the length of his penis. This statement explains why the size of the individual and the length of the penis are only noted down in about one-third of the cases. My table on preceding page is arranged according to the urinary distance found.

URINARY DISTANCE IN PROSTATIC ENLARGEMENT.

Case.	Name.	Malady.	Age.	Size.	Length of penis in inches.	Residual urine.	Urinary distance.
1	H.	Small peripheral atony .	72	Tall	2½	Total	7½
2	X.	Third lobe, small prostate	62	.....	.....	ʒiij.	8
3	H.	Moderate hypertrophy—bar	55	Short	4½	ʒj.	8
4	J.	Moderate peripheral . .	55	Tall	4¾	ʒviij.	8
5	C.	Moderate peripheral—bar .	64	.....	.....	ʒviij.	8¼
6	J.	Moderate peripheral—bar .	69	.....	.....	Total	8¼
7	W.	Moderate peripheral . .	60	.....	.....	ʒliss.	8¼
8	J.	Moderate peripheral . .	67	Medium	3¼	ʒss.	8½
9	A.	Moderate peripheral . .	62	.....	.....	ʒiij.	8½
10	W.	Moderate peripheral . .	47	Tall	4	ʒviij.	8¾
11	H.	Moderate peripheral . .	62	Medium	4½	ʒss.	9
12	C.	Large peripheral . . .	57	.....	.....	ʒii.	9¼
		Average, about . .	...	.....	.....	.....	8⅓

I consider it very remarkable that each of these tables should bring the average so nearly to an identical point, $8\frac{1}{7}$, 8 and $8\frac{1}{3}$ inches, but it only goes to prove that the normal urethra is about eight inches long, and that in prostatic hypertrophy it is longer.

Whether the urethra is longer upon the dead or living subject is unimportant. I have two good authorities who differ diametrically upon this point.

To test the question raised by Civiale as to whether the length of the penis should be considered a factor in estimating the urethral length (Civiale taking the negative), I have arranged tables from measurements of normal urethras, as follows:

LENGTH OF PENIS UNDER 4 INCHES.

No. of cases.	Size of individual.	Urinary distance.
3	Short.	$7\frac{2}{3}$

LENGTH OF PENIS 4 INCHES AND UP TO 5.

No. of cases.	Size of individual.	Urinary distance.
2	Short.	$7\frac{1}{2}$
5	Medium.	$8\frac{1}{5}$
0	Tall.	....

LENGTH OF PENIS 5 INCHES AND UP TO 6.

No. of cases.	Size of individual.	Urinary distance.
6	Small.	$8\frac{1}{6}$
3	Medium.	$7\frac{5}{6}$
2	Tall.	$8\frac{1}{2}$

LENGTH OF PENIS 6 INCHES AND UPWARD.

No. of cases.	Size of individual.	Urinary distance.
1	Short.	8¾
2	Medium.	8¼
5	Tall.	8½

This set of tables would go to show, although not very brilliantly, that the size of the penis is a factor, and it certainly is so if the penis be long and the man be tall. Case I. among the prostatics would go to show that it is the size of the penis rather than the size of the man that preponderates in the issue, for this gentleman, although six feet one inch tall, and having a small but peripherally enlarged prostate and total retention, yet having a penis two and one-half inches long, showed a urinary distance of only seven and one-half inches.

As to the pretension that the healthy urethra grows slowly in length with advancing age, irrespective of the size of the individual, the following condensation of my measurements goes to show that this is the case:

No. of cases.	Age.	Average length.
14	21 to 25	8 1/16
16	26 " 30	7⅝
15	31 " 35	7⅝
17	36 " 45	8¼

I have arranged these cases so that each group shall hold nearly the same number of individuals, although as to age the first three sets cover five years each, and the last ten, and it may be noted that, although the first set does not fall into line with the theory, yet there is a manifest progression in the remainder of the series.

Upon the foregoing study I think I may venture to base the following conclusions:

1. The urinary distance varies in the adult healthy male from something over six to something under ten inches, but may be honestly averaged at eight inches.

2. The shorter lengths are found in short individuals having a small penis. A large organ naturally contains a long urethra, and this is most certainly the case if the individual be tall.

3. The age of the individual seems to cause a very moderate increase in the urethral length, irrespective of disease, or perhaps even of individual size.

4. In prostatic hypertrophy the urinary distance averages more than eight inches, and is longer in cases of peripheral general hypertrophy than where the enlargement is median, or in cases of bar.

5. In a doubtful case a consideration of the urinary distance may become an important element of diagnosis.

TWO CASES OF ACUTE ASCENDING PARALYSIS, WITH AUTOPSY.

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(*From the Pathological Laboratory of the Boston City Hospital.*)

In 1859 the French physician Landry published his paper describing a disease which, until that time, had been confounded with others. His original description of this disease was that it was an acute paralysis beginning in the legs, ascending to the arms, and later involving the muscles supplied from the medulla. This paralysis was unaccompanied by any marked disturbance of sensation, although he stated that, at times, slight paræsthesiæ might be present. The sphincters were usually unaffected. He also stated that the paralyzed muscles retained their excitability to the faradic current, that the mind remained clear, and that fever was slight or absent. Another criterion which he gave was that after death no lesions were to be found in the nervous system, and that the careful microscopic examination of the cord was negative.

Since that time many cases have been reported as examples of this disease, many of which have varied considerably from the original picture as described by Landry.

The two following cases present a picture very closely resembling the original case described by Landry, and are reported together, because in both cases pathological examinations were obtained and made. I am indebted to Dr. Sears for permission to use the clinical notes of the first case, and to Dr. Folsom for those of the second case; also to Dr. Bullard for permission to use notes which he had made. I also wish to express my thanks to Dr. Councilman, who kindly allowed me to examine the material and aided me in the work.

Case I.—N. G., female, aged thirty-six years; single. She entered the Boston City Hospital on August 29, 1896. She was born in Vermont, and her occupation was that of a housekeeper. One brother died of phthisis. Her mother was said to be very nervous, and died suddenly three years ago of heart disease. The father was alive and well. The patient was never very strong, and lost much time from school. She had diphtheria and scarlatina when a child, and measles and mumps two years ago. Since that time she had been well, until last March, when she began to run down. Two years ago, after the shock of the death of her mother, she had a period of numbness in the right arm, lasting several weeks. This was not accompanied by any loss of strength. Her appetite was good. She denied the use of alcohol and morphine, and drank no tea nor coffee. There was no venereal history. Four

years ago she had an ischio-rectal abscess, resulting in a fistula which remained unhealed.

Present Trouble. In March, 1896, she took a severe cold, and since that time had not felt so strong. She had lost twelve pounds, and felt weak, and was easily tired. She had considerable dyspnœa at times, and complained that "the food was heavy on her stomach" and caused distress. The bowels had been much constipated. The appetite was good. The catamenia were regular and without pain. She had never been subject to headache, but about a year ago her eyes pained her, and she procured glasses, and had no trouble after that. She had been much confined to the house. On August 5th she had an attack of indigestion. She went to bed and took salts and calomel. Toward evening of that day she noticed a weakness in her legs, and that she had difficulty in going up stairs. She went to bed feeling perfectly well, except for this weakness, but on waking in the morning she found that she could not move her legs at all. The legs felt numb and dead, and they were somewhat painful to pressure. The bowels had moved once after the calomel, but not after that (paralysis of the rectum?). There was also retention of urine.

Physical Examination. The patient was bright and intelligent. She was well developed and had good color. The pupils were clear, regular, normal in size, and reacted to light and with accommodation. The external ocular muscles were normal. The tongue was moist, with a white coat, and was protruded in the median line. The pulse was regular, of good strength and volume.

Heart: The area of cardiac dulness was not enlarged, the apex was in the fifth interspace, three and three-quarter inches to the left of the median line. The heart's action was regular. The first sound at the apex was roughened.

Lungs: The resonance and respiration were good throughout. The area of hepatic dulness extended from the sixth rib to the costal border.

The area of splenic dulness was not enlarged.

The abdomen was tympanitic, not tender.

There was slight power of flexion of both legs. The toes and feet could be moved slightly; those of the left foot more than the right. The patellar and plantar reflexes were absent. The sensation was nowhere affected. There was considerable tenderness on pressure in the calves of the legs. In the upper extremities the grasp was weak on both sides, the left more so than the right. What muscular power remained in the arms was greater on the right side. The sensation here was normal, as also on the trunk. There was no tenderness in the upper extremities on pressure.

On August 14th a small area of bronchial breathing was noted just above the angle of the scapula and just outside of the median line in the left back. There was no cough and no expectoration. There had been considerable dyspnœa. The temperature had fallen somewhat, but the respirations had increased in number. The bowels moved only by enemata. The urine was passed spontaneously. Since entrance the strength of the right arm had diminished. On this day she could flex and extend the forearm slightly, but could not raise the arm from the bed. The only movement remaining in the left arm was a slight movement of the fingers. There was absolutely no movement possible of the lower extremities. The tenderness upon pressure in the legs had diminished.

The examination of the urine on August 14th showed it reddish in color; specific gravity of 1.018; alkaline in reaction; chlorides diminished; the urea normal in amount; albumin, a trace. Bile pigments and sugar were absent. The sediment showed quantities of triple phosphates, some pus, a little abnormal blood, a few questionable granular casts, and several large round cells.

On August 18th it was noted that the tenderness in the arms and legs upon pressure had returned. The patient could still flex the left arm feebly. Other movements were impossible. There was incontinence of urine.

A second examination of the urine, made upon August 19th, was as follows: Color, light; specific gravity, 1.017; reaction neutral; chlorides diminished; urea normal; a trace of albumin was present; bile pigments and sugar were absent. The sediment consisted chiefly of pus, with a few small round cells, a few triple phosphates, but no casts were found.

On the 19th there was paralysis of respiration. On the 22d it was noted that she had periodical attacks of difficult breathing, when the throat seemed to choke up and suffocation threatened. She had had two severe attacks of this kind, both of which passed off. All the muscles of respiration were noted upon this day as being inactive except the diaphragm. She complained that she could not get into a comfortable position, and she had to be moved continually.

On the 23d it was noted that there was slight movement possible of the left wrist, and that she could flex and extend the fingers of the left hand. The right arm could be slightly abducted, but could not be moved backward or upward. All movements of the right forearm and wrist were possible. There was complete paralysis of all the muscles of the lower extremities, of the abdominal muscles and the muscles of respiration, with the exception of the diaphragm. There was no paralysis of the face, tongue, or pharynx. The sensation everywhere was normal. There was considerable tenderness in the calves and slight tenderness in the thighs upon pressure. The glands in the neck were enlarged. The liver could be felt at the level of the umbilicus and could be seen to move with the movements of the diaphragm. The patient was unable to cough or to make forced expiration.

On August 24th at 8.30 A.M. the patient was found breathing with difficulty, the face was cyanotic, but she had no difficulty in speaking. The nurse reported that at 7 A.M. the patient had seemed as usual. From 8.30 A.M. the dyspnœa increased gradually, the pulse became weaker, and she died at 11.50 A.M.

CHART.

	Temperature.		Pulse.		Respiration.	
	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.
9th,	.....	102°	....	95	....	24
10th,	101°	101.5	94	95	23	24
11th,	101	101	90	94	24	20
12th,	99.4	99.8	100	100	24	24
13th,	99.8	100.8	100	100	24	28
14th,	100	98.5	100	90	40	28
15th,	98.4	98.4	96	90	32	28

	Temperature.		Pulse.		Respiration.	
	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.
16th,	98.2°	98.4°	80	72	24	24
17th,	98.4	99	72	70	24	24
18th,	99	98	80	84	24	24
19th,	98	99	80	84	28	26
20th,	98.4	100	100	104	25	26
21st,	98.2	98.8	88	100	24	24
22d,	99.2	100	100	110	36	32
23d,	98.6	98.4	114	112	32	28
24th,	98	.....	140	.....	44	...

Autopsy, August 25, 1896. The body was that of a woman of about forty years of age. Body length 162 cm.; fairly well developed; poorly nourished. Abdomen markedly distended. The feet in the position of extreme dorsal flexion. Fingers sharply and apparently forcibly flexed on the metacarpals. Subcutaneous fat much diminished.

The intestines, particularly the large intestines, were widely distended, containing much gas with considerable feces.

The appendix was 8 cm. long, extending down behind the ileum, the tip overhanging the pelvis; it was free throughout its whole extent.

The heart weighed 220 grammes. The muscle was deep red in color. The valves and cavities were normal.

The left lung was adherent over a small portion of the upper lobe by old adhesions. In the lower lobe of the left lung a large area was apparently completely solidified; on section this was mottled, yellow and deep red; the bronchi in this region were filled with a yellow, purulent material. The right lung was normal except for considerable fluid at the base.

The liver weighed 1020 grammes. It was normal in color, and on section normal in appearance.

The spleen was flabby, of a grayish-red color, on section rather soft, the pulp normal, weight 80 grammes.

The kidneys together weighed 260 grammes. The cortex was much thinned, in parts being from one-third to one-half cm. thick. The whole kidney was deeply injected, the glomeruli standing out as bright red points. The capsule was rather adherent, and some of the cortical substance adhered to it when it was torn off.

On the right side in front of the uterus there was a large, hard, pedunculated tumor. On section this was white and firm. Otherwise the uterus and appendages were normal.

The bladder contained a small amount of thick, yellow, cloudy urine.

The mucous membrane of the bladder was much injected. Scattered over the surface were prominent masses of good-sized vessels, and the tissue about these areas was deeply injected.

The aorta had scattered over its surface many small yellow, opaque, prominent areas.

The nerves of the lumbar and sacral plexus, as well as the pneumogastric, on either side, were removed for microscopic examination. No gross change was apparent. The dura of the cord was distended with considerable clear, rather thick, serous fluid. No gross lesions were apparent in the cord.

Bacteriological Report. Cultures from the heart, liver, and spleen

were sterile. Those from the kidney gave colon bacillus and liquefying organisms. Cultures from the spinal cord showed liquefying organisms.

The stains used in the examination of these two cases were those of Nissl and Lenhossek for the ganglion cells; Weigert's and Pal's myelin sheath stains, phosphomolybdic acid hæmatoxylin, hæmatoxylin and eosine; Van Gieson's picric acid and acid fuchsin stain; Mallory's methods of staining the neuroglia fibres with gentian-violet, and phosphotunstic acid hæmatoxylin; and Weigert's and Loeffler's stains for micro-organisms; together with Marchi's method of staining for fat. For the peripheral nerves, Marchi's and Weigert's methods and hæmatoxylin and eosin were the stains used.

After hardening, the anterior portions of the gray matter showed darker in color than the remainder of the gray matter of the cord.

Sections of the lumbar cord stained by Pal's method showed the white matter of the cord with low power normal, except that the small bloodvessels entering from the membranes were dilated and filled with blood.

There was no marked degeneration in any of the nerve-tracts. The posterior nerve-roots were normal. The anterior nerve-roots showed very marked degenerations, fully two-thirds of the fibres having disappeared. The posterior horns of the gray matter were perfectly normal, both as to nerve-cells and fibres. The anterior horn on the right side was totally replaced by an apparently homogeneous grayish area. In the left horn the condition was the same, but there remained unaffected a small portion toward the anterior fissure, which was about one-fourth of the total anterior horn.

On examination with a high power there were seen in the white matter of the cord numerous single nerves which were degenerated. Some of them were greatly swollen, the myelin sheath often very thin and more or less broken up, and occasionally there were drops of myelin within the myelin sheath. The posterior nerve-roots showed very few degenerated fibres. Occasionally one was seen where the myelin sheath was thinner than normal. In the anterior nerve-roots a greater part of the nerve-fibres had disappeared. Of those that remained about one-half appeared normal. In the others the myelin sheath was reduced to a mere thread, and large, irregular drops of myelin were present. In the posterior horns of the cord the nerve-fibres and cells appeared unchanged. In the anterior horns the portions which with the low power presented the homogeneous appearance were seen to be made up of a mass of smaller and larger cells, some containing sharply staining nuclei, others with indistinct nuclei, and here and there in the left horn near the borders of the degenerated area were large, irregular masses of myelin and occasional cells staining a homogeneous brown, apparently degenerated nerve-cells, only one or two of which show any signs of a nucleus remaining. Many of these small cells throughout the degenerated area contained irregular drops of myelin staining black, and at the borders of the area were occasional large masses of myelin or remains of a degenerated myelin sheath.

Sections of the lumbar cord stained with hæmatoxylin and eosin showed dilatation and injection of the small bloodvessels extending into the cord, both those from the periphery of the cord as well as those from the anterior fissure. In many of the vessels the perivascular lymph space was entirely filled with large and small lymphoid cells, which also infiltrated the wall of the vessel itself.

The vessels of the posterior column of the cord and of the posterior nerve-roots showed only very slight infiltration of the perivascular space. Many of them were entirely normal. In the anterior nerve-roots about the smaller vessels there was considerable infiltration with round cells, and round cells were seen with greater frequency than normal all through the substance of the nerve-root. These cells were usually small, with small, round, deeply-staining nuclei, but many of them had large, single, faintly-staining nuclei, oval or round in shape, nearly filling the cell body.

The white matter of the cord in the lateral columns showed, aside from the infiltration about the bloodvessels, practically normal appearances. Some of the small vessels contained an accumulation of leucocytes, from which apparently a slight emigration into the surrounding tissue was taking place. This was not generally true. In the majority of the vessels there was no such accumulation of the leucocytes, but there was a small, round-cell infiltration of the vessel walls and of the perivascular lymph spaces. This infiltration about the vessels was more marked in the case of the arteries. Most of these cells were small, with round, very deeply-staining nuclei, almost filling the cell. Others, fewer in number, with slightly granular protoplasm, contained a round or oval granular nucleus which stained intensely. Leucocytes were few in number. There was no hemorrhage about the vessels in the substance of the cord.

The degenerated portions of the anterior horn of the gray matter appeared totally disorganized. Only occasionally in the borders of this area could be seen the remains of nerve-cells. These were small, shrunken, homogeneous-staining masses of protoplasm, occasionally showing indications of processes. In a few of them, one portion, taking the hæmatoxylin more deeply than the rest, showed the indistinct remains of the nucleus.

The degenerated area itself consisted of a disorganized mass of cells and detritus. These cells varied in size, some of them being small, round, lymphoid cells, with round, deeply-staining nuclei, surrounded by a narrow band of clear protoplasm. Other cells were similar to the large lymphoid cell with nucleus rather small in relation to the cell body, and the nucleus divided into a number of granules with more or less reticulum between them. These cells were the plasma cells of Unna. The protoplasm was finely granular, and with methylene-blue stained more deeply than that of other cells. They were found chiefly in the vicinity of the vessels, but also to a certain extent scattered among the other cells. Very rarely there were seen large round cells with irregular, less deeply-staining nuclei similar to those of leucocytes.

The small round cells similar to lymphocytes were comparatively few in number. There were also scattered about a considerable number of large vesicular cells; in some of them the nucleus was round, in others similar to that of a leucocyte. These cells were the ones spoken of below as containing the drops of myelin and fat. There were numerous larger and smaller hyaline masses scattered through this area, sometimes drawn out, sometimes in rounded masses, evidently the remains of nerve-cells and nerve-fibres. One of these masses was found partially surrounded by a large vesicular cell. Occasionally throughout the whole of this area large vesicular cells were seen filled with drops of fat and myelin, as was shown by the sections stained according to Pal and

Marchi. These sections also showed the presence of fat and myelin drops in a large portion of the smaller lymphoid cells. Scattered throughout this area were masses of myelin or fat not contained in cells. Occasionally about one of these drops of myelin could be seen a portion of a degenerated myelin sheath. This same section showed that the degeneration of nerve-fibres in the lateral columns, while involving numerous nerve-fibres, was still moderate in amount. The same was true of the posterior nerve-roots. The anterior nerve-roots showed signs of very extensive destruction of the myelin sheaths.

Sections stained with phosphomolybdic acid showed nearly normal conditions in the white matter of the cord and of the posterior horns of the gray matter. There were almost no nerve-cells in the anterior horn.

Sections stained by Nissl's method showed the presence of perfectly normal nerve-cells in the posterior horns; while in the anterior horn on the right side in one section there were only four nerve-cells, two of which were irregular, round masses of protoplasm containing no granules, with intensely-staining nuclei. The other cells showed the nucleus and nucleolus somewhat more plainly; the granules were fairly distinct, but smaller than normal. But one or two processes could be seen to be given off from the cells, and these could be traced but a very short distance from the cell-body, apparently ending abruptly.

In one of these sections a cell lying in the wall of a vessel showed in its nucleus a karyokinetic figure.

Sections of the lumbar cord stained by Mallory's stain for neuroglia showed no increase in the neuroglia anywhere in the cord, and practically complete absence of the neuroglia fibres in the degenerated areas of the anterior horn.

Sections of the dorsal and cervical cord showed practically the same conditions that were seen in the lumbar regions. The degeneration of the anterior nerve-roots was fully as extensive as in the lumbar sections, while the posterior nerve-roots showed practically normal conditions.

In the dorsal cord the disintegrated area in the anterior horns of the gray matter, the infiltration of the bloodvessels of the cord and of the anterior nerve-roots was fully as extensive as lower down. In the cervical cord, the right anterior root showed only a small area of degeneration in its anterior portion. The left horn showed more extensive degeneration involving the anterior and median portions of the horn from its base down to the centre of the gray commissure. Infiltration about the bloodvessels of this portion of the cord was less extensive than lower down, but many of the vessels were widely dilated and filled with red blood-corpuscles, with comparatively few leucocytes, while the infiltration of the walls of the vessel was extensive in some portions and very little in others.

Sections of the cord at various places stained by Weigert and Loeffler's methods for micro-organisms failed to show the presence of any organisms.

Sections of the sciatic nerve stained by Marchi's method were in general normal. The longitudinal sections showed slight degeneration of the myelin sheath. Cross-sections of the nerve showed similar degeneration, but not very extensive.

Sections of the pneumogastric nerve showed marked fatty degeneration. In the longitudinal sections there was a great deal of fat in the myelin sheath. In addition, the sheath was swollen and in many places

had a grayish tinge. The axis-cylinder was also swollen and beaded. In places where the nerve-sheath was most degenerated the axis-cylinder was not apparent. In other places where the myelin sheath was swollen and grayish it was difficult to make out the axis-cylinder. Cross-sections of this nerve showed in places swollen nerve-sheaths without axis-cylinders. Other nerve-fibres showed fat-granules often within the myelin sheath and lying close to the axis-cylinder. The nerves in which the myelin sheath was granular, grayish, and swollen, here showed more evidence of the presence of fat-globules than was shown in the longitudinal sections. In the anterior crural nerve the nerve-sheaths occasionally showed slightly degenerated fibres, but these were less numerous than in the other nerves. The phrenic nerve showed a much less degree of degeneration than the pneumogastric. The nerve-fibres replaced by fat-granules were much less numerous, but in the grayish swollen nerve-sheaths swollen and beaded axis-cylinders were often evident.

Sections of the pneumogastric nerve stained with hæmatoxylin showed the axis-cylinder of many of the fibres distinctly swollen and beaded. The bloodvessels were injected everywhere, and in the sheath of the vessels there were numerous round cells and, in places, slight accumulations of round cells, which often extended from the connective tissue slightly into the nerve.

Summary of Microscopic Examination. 1. Acute inflammatory exudation of the anterior horns of the gray matter, with parenchymatous degeneration of the nerve-cells and processes.

2. Infiltration of perivascular lymph spaces and dilatation of vessels of the anterior horns.

3. Moderate infiltration about the vessels of the posterior horns and of the white matter of the cord.

4. Slight parenchymatous degeneration of the nerve-fibres of the white matter of the cord.

5. Slight degeneration of the posterior nerve-roots and marked degeneration of the anterior nerve-roots.

6. Parenchymatous degeneration and perivascular infiltration of the peripheral nerves.

7. Absence of micro-organisms in sections and cultures.

Anatomical Diagnosis. Broncho-pneumonia of left lung. Chronic, diffuse nephritis. Arterio-sclerosis of aorta. Myoma of uterus. Acute anterior poliomyelitis.

Case II.—V. F., male, aged thirty-five years, married, was born in Italy, and his occupation was that of a laborer. The patient entered the Boston City Hospital, October 5, 1896. His family history was negative. He had been four years in Boston. He denied the use of alcohol, and, so far as known, had been well and strong up to twelve days before. At that time he began to be troubled by numbness and weakness in his legs. This increased for two days, at which time he was obliged to give up work and go to bed. He had very little pain, and no nausea or vomiting. He was said to have had one attack of dyspnœa on the day of his entrance into the hospital. He ascribed his trouble to exposure to cold and rain. His chief complaint was numbness in the legs.

Physical Examination. The patient was a well-developed and nourished man. The pupils were equal in size and reacted to light. The

tongue was protruded straight, and was moist, with a slight coating. The pulse was regular, of good strength and volume. The area of cardiac dulness, the cardiac sounds, and action were all normal.

The resonance over the lungs was good throughout. The respiration everywhere was accompanied by squeaking and sonorous râles, and a few coarse, moist râles.

The areas of liver and splenic dulness were normal. The abdomen was negative. There was marked paralysis of both lower extremities, the only motion possible being a slight flexion of the knees. There was also marked weakness of the muscles of the trunk and neck. The head could be rotated, but not raised. There was a very slight power of contraction of the abdominal muscles, and a marked loss of power in all the muscles of the upper extremities. The arms could be raised very slightly only; the grasp was weak. The patellar reflexes were absent, as were also the reflexes of the arms. The plantar reflexes were present, but very slow. The cremasteric and abdominal reflexes were normal. The sensation for pain was everywhere normal. There was no tenderness along the spine or over the great nerve-trunks.

Examination of the urine made October 6th showed the color normal; the specific gravity 1.025; acid reaction; chlorides increased. Albumin, bile pigments, and sugar all absent. On October 7th it was noted that the patient complained of no pain, and took his nourishment well. There was no retention of urine, but the bowels had not moved. In the night he had an attack of dyspnœa, and had been unable to expel the mucus from his throat. That morning marked conjunctivitis was noted. At 6.30 o'clock that evening he began to have severe dyspnœa, the pulse became weak, and the extremities cold. He was given strychnine subcutaneously, but died at 7 o'clock.

CHART.

	Temperature.		Pulse.		Respiration.	
	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.
Oct. 5th,	98.6	98.6	96	88	24	24
6th,	98	98.4	80	92	20	24
7th,	97.8	97.2	124	120	24	32

Autopsy, October 8, 1896. The body was that of a man about forty years of age. Body small, tolerably well nourished. Rigor mortis extremely well marked.

Scalp normal. Skull of ordinary thickness; dura not adherent; rather hyperæmic. The inner meninges and the brain itself hyperæmic. The gray matter of the brain had a pinkish hue on section. The hyperæmia seemed to be best marked in the great ganglia at the base.

Subcutaneous fat normal in amount. Muscles well developed. The spinal canal was opened in its entire extent, and the cord, together with most of the posterior nerve-roots, removed. A number of the spinal ganglia were removed with cord. The meninges of the cord were hyperæmic. The cord itself was well preserved, somewhat hyperæmic; nothing abnormal in the nerves. Long pieces of each sciatic nerve were removed.

In the posterior portion of both lungs, especially the left lung, and in this also along the anterior lateral border, there are numerous dark

areas from which occasionally some pus could be expressed from the bronchi. Others seemed to be due entirely to hemorrhage. In the bronchi there was some muco-purulent exudation.

Heart of ordinary size, weight 240 grammes; valves normal; myocardium very dark.

Spleen, weight 175 grammes; very lax, slightly enlarged; on section, of pale brownish color; Malpighian bodies not visible; trabeculæ slightly increased. The kidneys together weighed 175 grammes. Both of about the same size; both intensely hyperæmic; markings normal; capsule easily stripped off.

Liver, weight 1200 grammes. Dark red; on section, hyperæmic; markings faintly visible. The gall-bladder contained thin, dark bile.

The adrenal glands normal. Pancreas hyperæmic and extremely soft.

The mucous membrane of the entire intestinal canal normal, save just above the ileo-cæcal valve, where there was very slight enlargement of the follicles. The mesenteric glands were enlarged and reddened.

Arteries and veins normal.

Bacteriological Examination. Cultures from heart, liver, spleen, kidneys, meninges of brain, and spinal cord were sterile. Four cultures were taken from the brain, three from the meninges of the brain, and one from the spinal cord. Three of these (two from brain and one from meninges) showed no growth. Dilutions and replants from the others showed nothing but saprophytes (a spore-forming bacillus), a large coccus, and a large diplococcus.

Microscopical Examination. Sections of the lumbar cord stained according to Pal showed no changes in the white sections of the cord. The fibres and nerve-cells of the gray matter appeared normal, the nerve-cells being present in normal numbers and showing no changes by this stain. The nerve-fibres in the gray matter were also unchanged. The bloodvessels in the anterior horn appeared distended and filled with blood. There was no infiltration of their walls, but the perivascular lymph spaces of some of them were dilated. The posterior nerve-roots were normal. The anterior nerve-roots showed degeneration of a considerable number of nerve-fibres.

Sections stained with phosphomolybdic acid showed no diminution of nerve-fibres and no changes in the nerve-cells. The axis-cylinders of the anterior roots were occasionally absent, while others stained poorly.

Sections stained with hæmatoxylin and eosin showed no changes beyond the dilatation of the vessels in or near the gray matter of the cord. These vessels contained generally red blood-corpuscles and only a few leucocytes. There was no infiltration of the walls of the vessels. In others of these vessels there was an accumulation of small round cells, with deeply-staining nuclei.

Sections stained for neuroglia showed no increase of this substance anywhere in the cord.

Sections stained with Nissl's stain showed that in a large majority of the cells of both anterior horns there was a diminution of the protoplasmic granules. In some cells there remained in the periphery of the cell nearly normal granules, while the central portion of the cell showed a slightly yellowish homogeneous appearance dotted with a few very small, irregular granules, with no signs of nucleus or nucleolus. In other cells the nucleus could not be made out, but the nucleolus stained

indistinctly, and the whole body of the cell was filled with very fine granules, like dust, with very few or no normal granules. Those which were present were only seen at the periphery of the cell. Other cells showed finely granular detritus at one end of the cell, while the other was clear, showing no granules whatever, with no signs of nucleus or nucleolus anywhere to be seen. The cell-processes even of these degenerated cells appeared normal. The cells seen in other portions of the gray matter showed normal granules and nucleus and nucleolus. In the anterior horn, along with these changed cells, were others which appeared nearly or quite normal, the only thing noticeable in them being an irregularity in the size of the granules.

Sections stained according to Weigert and Loeffler showed no micro-organisms present in the substance of the cord. Sections of the dorsal and cervical cord at various places showed the same changes in the large motor cells of the anterior horns, fully one-half of the cells of the dorsal region of the cord being affected, though to a slighter degree than the cells of the lumbar cord. Changes in these cells again became more marked and involved a greater number of the cells in the cervical portion of the cord.

Sections of the medulla stained by Nissl's method showed no changes in the nerve-cells, the granules being sharp and clear, the nucleoli staining well, and the nerve processes appearing normal. In the sections of the cortex of the brain, in some of the larger nerve-cells the granules were smaller than normal and more or less irregularly scattered throughout the whole cell-body. No cells were seen where the granules had disappeared or where they had been replaced by granular dust. The smaller cells of the cortex appeared normal.

Sections of the dorsal and lumbar spinal ganglia stained by Nissl's method showed the ganglion cells in general quite normal. Occasionally one was seen containing a vacuole, while in all of them the protoplasmic granules were rather small. Otherwise the sections of these ganglia appeared perfectly normal.

Sections of the left anterior crural nerve treated by Marchi's method showed numerous fat-globules within the nerve-sheaths. In places the nerve-sheath was entirely replaced by fat-globules. The axis-cylinder had completely disappeared. Other fibres showed a brownish discoloration of the nerve-sheath, which was more granular and swollen than normal, while the axis-cylinder was swollen and beaded. These changes were seen to a greater or less extent in more than half the fibres in the section.

Cross-sections of the same nerve showed drops of fat in the myelin sheath, in other places occupying the centre of the sheath, the position of the axis-cylinder which had disappeared. Other fibres showed a thin line of fat in the myelin sheath. The nerve-fibres varied somewhat in size, but the greatly swollen ones were comparatively few in number, and in these the axis-cylinder could not be made out at all, the centre staining a homogeneous gray color, or the whole nerve-fibre being represented by a single large globule of fat.

The left sciatic nerve, in longitudinal section, showed the same condition as the anterior crural nerve, but affecting a greater number of fibres, and the fat-drops were much more numerous; seldom was a nerve-fibre seen which was free from them, while the beaded appearance of the axis-cylinder was seen in a greater number of them.

Cross-sections showed comparatively few of the nerve-fibres unaffected by changes. The majority of them were replaced by fat-globules, while most of the remainder were stained a grayish brown.

The right sciatic nerve showed similar changes, which were as well marked and fully as extensive as in the left sciatic nerve, fully three-fourths of the fibres in the cross-sections being more or less extensively degenerated.

Sections of the left sciatic nerve stained with hæmatoxylin showed an increase of the connective-tissue nuclei throughout the nerve, and considerable infiltration of small lymphoid cells in the walls of the vessels and about them, both outside and within the nerve-bundles proper. In cross-sections about one-half of the axis-cylinders could be seen, but many of those present were much smaller than normal, while others were greatly swollen, and in many cases the axis-cylinder could not be made out. Infiltration of the vessel walls was well marked in this section also.

Sections of the left anterior crural and right sciatic nerves stained with hæmatoxylin and eosin showed changes similar to those described in the left sciatic nerve, though in the former nerve the proliferation of nuclei and the infiltration of the vessel walls were much less marked.

In sections of the left anterior crural nerve, stained with Weigert's nerve-sheath stain, the majority of the fibres were seen to retain the myelin sheath, approximately one-third of them only being affected by degenerative processes.

SUMMARY. Microscopic examination showed: 1. Parenchymatous degeneration, varying in extent, of the peripheral nerves, present to a greater or less extent in all the nerves examined.

2. Degenerative changes in the large ganglion cells of the anterior horns of the cord, with destruction and fragmentation of the protoplasmic granules and loss of the nuclei of the cells.

3. The nerve-cells of other portions of the gray matter of the cord, medulla, brain, and spinal ganglia unchanged.

4. No change of the white matter of the cord.

5. Absence of micro-organisms in the tissues.

Anatomical Diagnosis. Broncho-pneumonia and hemorrhage of the lungs. Enlargement of the spleen. Congestion of the kidneys. Congestion of the brain and cord. Parenchymatous degeneration of peripheral nerve and motor cells of cord.

After Landry's original publication, there were published in the same year by Kussmaul some similar observations. Yet neither of these papers attracted much attention until Pelegrino Levi in 1865 published another paper upon this disease, and ascribed the death of the celebrated zoölogist Cuvier, who had died of an acute descending paralysis, to this cause.

In 1871 Bernhardt expressed the opinion that the disease was due to a poison. This conception that Landry's paralysis depended upon an intoxication was accepted by Westphal, who in 1876 characterized the

disease as one with a progressive, ascending, finally fatal course, with retention of the electrical irritability of the paralyzed muscles, with negative results upon autopsy. This conception of Westphal was soon very much widened, and numerous cases were reported from all sides, which varied in the widest way from the descriptions hitherto given of the disease.

In 1889 Ross, in a series of articles, maintained that this disease was identical with peripheral neuritis. This view was also held by Nauwerck and Barth, in a paper published by them in the same year, and has been the cause of numerous discussions since. The earlier autopsies gave generally negative results, but, as time went on, those in which pathological changes were found began to be more numerous, and it may be assumed that the previous failures to find pathological changes were in many instances due to imperfect methods of examination.

Again, the great diversity of lesions described can undoubtedly be explained from the fact that many writers included cases which probably belonged in classes by themselves. Many of Ross's cases, for instance, must certainly be considered as cases of peripheral neuritis, and the same is true of many other cases which have been published as Landry's paralysis. On the other hand, cases have been published and included in tables where the lesion was a disseminated or localized myelitis or a general central myelitis. Therefore, in the discussion of the pathological changes in Landry's disease, many cases which have been published under this title have been omitted, for reasons which seem sufficient. No attempt has been made to examine cases where a pathological examination was not made.

Among the cases which have been reported where the pathological examination resulted negatively was the original one of Landry,[1] where there was said to have been congestion of the membranes, but no lesion in the brain or cord. The peripheral nerves were not examined.

In Pelegrino Levi's case[2] the nerve-roots, spinal ganglia, vagi, cord, sympathetic and pneumogastric nerves were normal. In the second case reported by him, that of Baron Cuvier, there was no examination made.

Oulmont and Hayem[3] found in their case the spleen enlarged and a slight injection of the pia in the upper part of the cord; the gray matter of the cord reddened, and congestion of the capillaries. After hardening in chromic acid, there could be found no appreciable alteration anywhere. The muscles microscopically were irregularly striated and in places waxy degenerated.

[1] Landry. Sur la paralysie ascendante aiguë. Gaz. hebdom., 1859, vol. vi. p. 472.

[2] Pelegrino Levi. Contribution à l'étude de la paralysie ascendante aiguë, etc. Arch. gén. de méd., 1865, 6 série, vol. i. p. 129.

[3] Oulmont and Hayem. Paralysie ascendante aiguë. Gaz. des hôp., 1867, vol. xl. p. 405.

G. Harley and J. Lockhart Clarke[1] found congestion of the vessels of the cord and of the pia, with a softening of the anterior column, which involved the anterior nerve-roots, and more or less of the gray matter of the cord. The medulla appeared normal.

M. Bernhardt[2] found the brain, medulla, and cord normal. The vagi, sciatic, and sympathetic nerves were also normal. The specimens were examined after hardening in Müller's fluid, and fresh. No cultures were made. There was acute hyperplastic splenitis.

C. Westphal[3] reported four cases. In the first there was bronchitis, and tuberculosis was found in the lungs. The spleen was enlarged. The cord and medulla stained with carmine were normal.

In his second case the spleen was found slightly enlarged; the brain, cord, nerve-roots, ganglia, and muscles were normal; moderate degeneration of one of the crural nerves was found. There were no bacteria present in the blood.

His third and fourth cases probably do not come under the head of this disease of which we are speaking.

O. Kahler and A. Pick[4] found an acute hyperplastic splenitis. The cord was normal. There were adhesions between the spinal dura and pia. The nerves were not examined. The specimens were stained with carmine after hardening in Müller's fluid.

H. Kümmell[5] found enlargement of the spleen. The cord was examined after hardening in Müller's fluid and staining with carmine, hæmatoxylin, and methyl-violet. The cord was normal. The peripheral nerves were not mentioned. There was a bilateral hemorrhage in the medulla, without any infiltration of the tissues in the neighborhood with leucocytes. This patient had died of paralysis in the fourth week of typhoid, and the characteristic lesions of typhoid were found in the intestines.

A. Strümpell,[6] in his case, reports enlargement of the spleen, and that the cord, microscopically, was not pathological. The peripheral nerves were not examined.

In Mann's case[7] the spleen was not enlarged; the cord, medulla, and brain were normal. The peripheral nerves were not examined.

[1] Harley and Clarke. A Fatal Case of Acute Progressive Paralysis. Lancet, 1868, vol. ii. p. 451.

[2] Bernhardt. Beitrag. zur Lehre von der acuten allgemeinen Paralyse. Berlin. klin. Woch., 1871, vol. viii. p. 561.

[3] Westphal. Ueber einige Fälle von acuter tödtlicher Spinallähmung. Arch. f. Psych., 1876, vol. vi. p. 765.

[4] Kahler and Pick. Zu der Lehre von der acuten aufsteigenden Paralyse. Arch. f. Psych., 1880, vol. x. p. 313.

[5] Kümmell. Zur Lehre von der acuten aufsteigenden Spinalparalyse. Zeitsch. f. klin. Med., 1881, vol. ii. p. 273.

[6] Strümpell. Zur Kenntniss der multiplen degenerativen Neuritis. Arch. f. Psych., 1883, vol. xiv. p. 353.

[7] Mann. Landry's Paralysis. Med. Chron., Manchester, 1887, vol. vi. p. 99.

Greppin,[1] in his case, found the brain, cord, peripheral nerves, the spinal ganglia, and nerve-roots healthy. Cultures were negative.

J. A Ormerod[2] reports three cases. In his first the spleen was large and soft. The brain, sciatic and vagus nerves were normal. The stains used were Weigert's, picrocarmine, and aniline blue-black. The cord, stained with carmine, Pal's stain, aniline blue-black, also showed no changes. In his second case the spleen was also enlarged. The cord, hardened in Müller's fluid and stained in aniline blue-black, showed no changes. The anterior tibial nerve, hardened in Müller's fluid, and the cauda equina, hardened in osmic acid, were both normal. In the third case the spleen is reported as rather larger than normal, weight ten and a half ounces, and soft. The nerves, treated with osmic acid and Müller's fluid and stained with picrocarmine or Pal's stain, showed nothing abnormal. In one vagus nerve, however, some of the fibres seemed to take Weigert's stain more deeply than they ought. The cord, stained with picrocarmine, aniline blue-black, and by Pal's method, was normal.

J. Watson,[3] in his case, reports the membranes of the cord slightly congested, and says that no changes noticeable to the naked eye were present. He also adds that sections of the cord were hardened and examined microscopically, but threw no light upon the pathological changes.

A. Albu[4] reports in his case the spleen of normal size and consistency. The membranes of the cord were injected to a moderate degree. The cord was normal. The brain was rich in blood, and showed small hemorrhages in places. The cord was hardened in Müller's fluid and stained with carmine, nigrosin, and Weigert's stains, and showed nothing microscopically, and the bacteriological and microscopical examination of the crural and axillary nerves was negative. Cultures made from the blood, spleen, and cord were also negative.

Von Leube[5] reported a case in which the cord and peripheral nerves showed no changes. They were hardened in Müller's fluid.

M. Prince[6] reports a case in which the cord was microscopically normal. The nerves of the brachial plexus, stained by Weigert's method, showed no changes.

B. Robinson[7] reports a case in which the spleen was normal. In the

[1] Greppin. Correspondzbl. für schweizer Aerzte, 1892, vol. xxii. p. 517.

[2] Ormerod. Illustrations of Landry's Paralysis. St. Barth. Hosp. Reports, 1892, vol. xxviii. p. 137.

[3] Watson. Acute Ascending (Landry's) Paralysis. British Med. Journ., 1892, vol. ii. p. 1286.

[4] Albu. Zur Aetiologie der Paralysis ascendens acuta, etc. Zeitschr. f. klin. Med., 1893, vol. xxiii. p. 387.

[5] Von Leube. Diagnose der inneren Krankheiten. Leipzig, 1883, vol. ii p. 143.

[6] Prince. A Case of Landry's Paralysis with Autopsy. Journ. of Nerv. and Ment. Disease, 1895, vol. xxii p. 686.

[7] Robinson. A Case of Landry's Paralysis. Med. Rec., 1895, vol. xlvii. p. 534.

brain and spinal cord the bloodvessels appeared somewhat congested, but there was no softening. The cerebral convolutions were flattened, more especially over the right parietal lobe, where there was some bulging. In the right parietal lobe a tumor, two and one-half inches in diameter, firmer than the brain tissue, but rather soft, was found. This was found to be a spindle-cell sarcoma. Sections of the cord stained by Weigert's hæmatoxylin, Delafield's hæmatoxylin, and Van Gieson's stain showed no lesion, either inflammatory, degenerative, or of other nature.

This completes the cases found in the literature where the microscopic examination showed no changes. The cases in which changes have been found, but in the peripheral nerves only, or where the changes in the cord were so slight that no importance was attached to them by the writers, are the following:

Dejerine and Goetz[1] found in the cord, hardened in chromic acid and stained with carmine, no changes except that the vessels were somewhat dilated. In the nerves they found degeneration of the nerve-fibres, with increase of the nuclei of the neuroglia, in some of the anterior nerve-roots.

H. Eichhorst[2] found the spleen small; the brain and cord normal. The optic nerves and the optic chiasm were red in color. The peripheral nerves showed evidences of neuritis. This case, clinically, showed a marked diminution of sensation, with pain and tenderness in the extremities, and probably belongs to the cases of peripheral neuritis, as there were no bulbar symptoms. The case developed three weeks after an attack of malaria.

Dejerine[3] reported a case in which the brain and cord were negative; but there were alterations, which he considered of a parenchymatous nature, in the anterior nerve-roots and in the intramuscular nerves.

Curschmann[4] reports a case in which the spleen was four times the normal size. The intestine showed the characteristic changes of typhoid fever, from which the patient was suffering. The brain was normal in appearance. The pia of the cord was hyperæmic; the cord was said to be otherwise normal, except in the lumbar region, where the gray matter was slightly reddened. Upon microscopical examination of the cord a few small areas were seen in the lateral columns, which showed "a sort of swelling with thinning of the axis-cylinders," but no complete destruction of them. The cultures from the lumbar and dorsal cord were negative. Cultures from the upper dorsal and cervical cord and spleen

[1] Dejerine and Goetz. Note sur un cas de paralysie ascendante aiguë. Arch. de physiol., 1876, 2 série, vol. iii. p. 312.

[2] Eichhorst. Neuritis acuta progressiva. Virch. Arch., 1876, vol. lxix. p. 265.

[3] Dejerine. Recherches sur les lésions du système nerveuse, Paris, 1879.

[4] Curschmann. Bemerkungen über das Verhalten des Centralnervensystems bei acuten Infectionskrankheiten. Verhandlungen des V. Congresses für innere Med., 1886, vol. v. p. 469.

showed the presence of the typhoid bacillus, which was also demonstrated by inoculations. Bacilli were found in the sections of the cord only in the white substance of the cervical and upper dosal regions.

A. Nauwerck and W. Barth[1] reported a very typical case, except that the duration was somewhat prolonged (three months). The cord, hardened in Flemming's solution, as well as the medulla, showed no changes. The peripheral nerves showed a moderate degeneration. The lungs were the seat of a beginning tubercular process.

Ross[2] found the internal, antero-lateral, and postero-lateral groups of nerve-cells normal, while the central and median were diseased. There was "granular degeneration of the nerve network," with disappearance of the ganglion cells and increase of the nuclei, together with dilatation and congestion of the bloodvessels. In his second case he could discover no trace of disease in the cord. In an article published later,[3] in speaking of his first case, he says that after further study he came to the conclusion that the changes in the gray matter of the spinal cord were a minor matter.

C. Eisenlohr,[4] in his case, reports the spleen very large, containing no infarctions. In the ileum there were hemorrhages and swelling of the follicles, with enlargement of the mesenteric glands. The brain, cord, and medulla, stained with borax-carmine, nigrosin, and Weigert's stain, showed no changes. There was degeneration of the bulbar and peripheral nerves. Cultures were negative as regards bacteria, as well as smears upon cover-glasses, and the sections.

In his second case he found abundant serum in the spinal canal and the pia slightly œdematous. The spleen was not enlarged, but there was slight swelling of the mesenteric glands and of the follicles of the ileum, where were also found tubercular ulcers. The cord in the eleventh and twelfth dorsal segments showed swollen axis-cylinders in the lateral columns and degenerative products of the medullary substance. The gray matter was normal. He described this as an acute myelitis. The stains used were nigrosin, carmine, picrocarmine and hæmatoxylin. The right vagus was slightly degenerated; the left one normal. The lower cervical and upper dorsal anterior roots showed signs of degeneration. The anterior roots of the lumbar enlargement showed an increase of cells of the connective tissue and adventitia, but no degeneration. There was no degeneration present of the sacral roots. The right tibial nerve was degenerated. Cultures showed two organisms. The first was found in the cord, the spleen, the sciatic nerve, and was the staphylococcus cereus albus. The second organism was found in

[1] Nauwerck and Barth. Zur path. Anatomie der Landry'schen Lähmung. Zieg. Beiträge zur path. Anat. und allg. Path., Jena, 1889, vol. v. p. 1.

[2] Ross. Diseases of the Nervous System, second edition, New York, 1883, vol. i. p. 908.

[3] Ross. Peripheral Neuritis, Med. Chron., Manchester, 1889, vol. x. p. 376.

[4] Eisenlohr. Ueber Landry'sche Paralyse. Deut. med. Woch., 1890, vol. xvi. p. 841.

the spleen and sciatic nerve only, and was the staphylococcus pyogenes aureus. No tubercle bacilli were found. In the sections there were found a long and short bacillus and a coccus.

Hun[1] reports in his case a slight cerebral and spinal meningitis, with infiltration of the walls of the spinal veins. Aside from a degeneration of some fibres of the anterior roots of the cauda equina, the nervous system was normal. No bacteria were found in the tissues, and cultures made from them were negative.

E. Centanni[2] reports in his case that the vessels in the nerves were engorged and the walls were somewhat infiltrated. The nerve-fibres were not much altered. He designates the process as a slight degenerative interstitial neuritis. The cord showed congestion in the vessels of the pia, exudation about the central canal, and some atrophy in the peripheral zone of the cord. Other parts were normal. In the peripheral nerves he found a slender bacillus, with rounded ends, without spores or characteristic grouping. These were usually present in the endoneural lymph spaces. These bacilli were not found elsewhere. No cultures were made.

Giuzetti[3] found the spleen large and soft. There was some disintegration of the nerve-fibres of the cord, which was most marked in the lumbar region ; absent in the medulla. The ganglion cells were cloudy, with indistinct nuclei. About the vessels there was a ring of granular substance not staining like fibrin ; there were also recent punctiform hemorrhages in the medulla and pons. There was degeneration of both anterior and posterior nerve-roots, but most marked in the anterior ones. In the peripheral nerves there were multiplication of the nuclei and infiltration of some of the vessels. No bacteria were seen in the sections. Cultures made from the brain, cord, sciatic nerve, blood, spleen, mesenteric glands, and urine were all negative, except two tubes from the sciatic nerve and one from the cord, upon which grew a chromogenic bacillus. A rabbit injected with an emulsion of the spinal cord and spleen gave negative results.

The following are the cases found in the literature in which the changes in the cord were marked, whether or not degeneration of the peripheral nerves was found :

P. Baumgarten[4] reported in 1876 a case which is interesting as having been the first in which bacteria were found. These bacilli he identified as the anthrax bacillus. They were found in the lungs, in the spleen,

[1] Hun. The Pathol. of Acute Ascending (Landry's) Paralysis. New York Med. Journ., 1891, vol. liii. p 609.

[2] Centanni. Ein Fall von Landry'scher Paralyse. Ziegler's Beiträge zur path. Anat. u. allgem. Path., Jena, 1890, vol. viii. p. 358.

[3] Giuzetti. Riform. Med., 1894, vol. ii. pp. 5, 19, and 31. Quoted by Bailey and Ewing.

[4] Baumgarten. Ein eigenthümlicher Fall von Paralysie ascendante aiguë mit Pilzbildung im Blut. Arch. f. Heilkunde, 1876, vol. xvii. p. 245.

the spinal cord, and the blood. Cramer, in his review of the literature of Landry's paralysis, questions whether this identification of the bacillus found would be accepted at present. Baumgarten found a hyaline substance in the gray matter of the cord, in the commissure, the anterior fissure, and in the perivascular spaces, which he considered an inflammatory exudation. The vessels were distended with blood, and some were filled with pus-corpuscles.

C. Eisenlohr[1] found in his case the spleen enlarged and soft. The gray substance of the spinal cord was hyperæmic. After hardening in Müller's fluid the cervical cord showed exudation about the central canal and the vessels of the gray matter and in the anterior fissure. The nerve-cells were filled with granular pigment. These changes diminish both above and below, but the same appearances were found in the upper lumbar cord. The medulla showed cellular infiltration about the vessels, and the ganglion cells were swollen and shining, and here and there were capillary hemorrhages. The peripheral nerves were normal.

Schulz and Schultze[2] reported a case which is probably to be regarded as transitional between the typical cases of Landry's paralysis and the paralysis of Duchenne, in that the course was rather long (sixty days). They found degenerative processes in the lateral and pyramidal tracts, as also in the posterior columns. There was infiltration about some of the vessels. There were alterations in the gray matter in the anterior horns, particularly in the lumbar region; the ganglion cells were swollen, granular, and vacuolated. Swollen axis-cylinders were seen in the gray matter and also in the anterior roots. The same changes, but less intense, were found in the dorsal and cervical cord. In the posterior nerve-roots of the lumbar and cervical cord there was seen an occasional swollen axis-cylinder. These abnormal axis-cylinders were also seen in the facial nucleus; otherwise the medulla was normal. There were no bacilli found in the blood. They summed up the changes as consisting of a myelitis of the motor tracts and of the anterior gray substance of the whole cord, and of the lower part of the medulla. There were slight degenerative changes found in the sciatic, ulnar, and peroneal nerves.

Among these cases, in which changes more or less extensive were found in the spinal cord, we must mention two cases reported by Aufrecht.[3] There the changes found seemed more like a localized myelitis than the changes in the cases already quoted. In the first case, in the medulla, below the olive, the central part for the distance of a quarter

[1] Eisenlohr. Ein Fall von Paralysis ascendens acuta. Virch. Arch., 1878, vol. lxxiii. p. 73.
[2] Schulz and Schultze. Zur Lehre von der acuten aufsteigenden Paralyse. Arch. f. Psych., 1882, vol. xii. p. 457.
[3] Aufrecht. Pathol. Mittheilungen. Magdeburg, 1881.

of an inch was cloudy. Microscopically, numerous large fat-granule cells were found. In the second case, at the upper and middle third of the cervical cord over a space of about 2 mm. in length, were found several small spots, the size of the head of a pin, which upon microscopic examination was seen to be filled with granular detritus, a few red blood-corpuscles, and bodies resembling corpora amylacea.

Roussel[1] found vascular lesions in the cord, with degeneration of the ganglion cells. The peripheral nerves were not examined.

J. Hoffmann[2] found the membranes of the brain and cord much congested. In the medulla there was infiltration of the vessels of the meninges and nerve substance. In the corpus restiformis and pyramids there were occasionally swollen axis-cylinders. There was slight extravasation of the red corpuscles throughout the whole of the medulla. The infiltration in the cervical and dorsal cord was more marked. In the lateral columns of the cord there were small groups of swollen axis-cylinders. The same thing was true of the anterior roots. The ganglion cells were shiny and swollen, with indistinct nuclei. Small hemorrhages were seen in the cord, and particularly in the gray substance in the cervical and dorsal cord. The crural and left facial nerves were normal. The right facial nerve showed degenerated fibres. The examination of the blood for bacteria was negative.

Immermann[3] reports a case in which the patient died of pneumonia four weeks after the development of the paralysis. The brain, peripheral nerves, and muscles showed nothing. The anterior horns of the lumbar, dorsal, and cervical cord showed numerous reddish spots. On examination, the vessels were found filled with red corpuscles, and granular cells infiltrated the perivascular spaces. The ganglion cells were replaced in part by hyaline masses. The white substance of the cord was not affected.

Ketli[4] reported a case in which he saw changes in the spinal cord which were those of acute anterior poliomyelitis.

Iwanow[5] found the vessels of the spinal cord enlarged, as well as the capillaries of the gray matter, especially in the anterior horns. There were some capillary extravasations. The walls of the vessels were infiltrated. Similar changes were seen about the central canal, where there was also a fibrinous exudation. The nerve-cells appeared cloudy and swollen, and many of the nuclei were lost. The cord was hardened in Müller's fluid. The examination of the cord for bacteria by Gram's stain resulted negatively.

[1] Roussel. Arch. de med. nav., 1883, vol. xxxix. p. 370. Quoted by Bailey and Ewing.
[2] Hoffmann. Ein Fall von acuter aufsteigender Paralyse. Arch. f. Psych., 1884, vol. xv. p. 140.
[3] Immermann. Ueber Poliomyelitis ant. acuta und Landry'sche Paralyse. Neurolog. Centralbl., 1885, vol. iv. p. 304.
[4] Ketli. Wien. med. Blatt., 1887, vol. x. p. 250. Quoted by Bailey and Ewing.
[5] Iwanow. Zwei Fälle von acuter aufsteigender Spinalparalyse. St. Petersburg. med. Woch., 1888, vol. v. p. 393.

J. J. Putman[1] also found acute hyperplastic splenitis. The peripheral nerves showed signs of neuritis, and there was infiltration of the nerve-roots. The bloodvessels were crowded with blood. The perivascular spaces and the central canal of the cord contained a "moderate number of cells." The nerve-cells were essentially normal. In the white matter of the cord an occasional enlarged axis-cylinder was seen. In the medulla the vessels were engorged, and there was infiltration of the perivascular spaces, and occasionally slight hemorrhages.

R. T. Williamson[2] reports a case in which the paralysis began in the right hand, extending later to the left, and then to both legs. There was no disturbance of sensation; reflexes were absent; there was rapid atrophy of the muscles. After the first ten days the patient began to improve slightly, but died suddenly from some unknown cause. In the examination of the cord, in the outer part of the anterior horns, the gray matter was found infiltrated with small round cells, and some larger cells evidently containing myelin. The bloodvessels in the neighborhood were dilated and the perivascular spaces filled with round cells. There were no real hemorrhages. The nerve-cells were shrunken and had lost their processes. There was an absence of the normal nerves seen in the anterior horns, though these were present in the other parts of the gray matter. The remainder of the cord was normal, except that the bloodvessels were dilated, and there were infiltrations about some of them. There was an atrophy of the anterior nerve-roots. The posterior nerve-roots were normal. The pia was normal except for dilatation of its vessels and occasional round-cell infiltration at the anterior part of the cord.

E. Klebs[3] reported a case in which there was tubercular pericarditis from a small cheesy bronchial gland. The only change found in the nervous system was a hyaline thrombosis of the central arteries of the cord, with microscopical hemorrhages about these vessels and about most of the nerve-cells, consisting of a moderate or a greater number of round cells, with single large nuclei. Klebs ascribed this thrombosis to an acute infection.

Hlava[4] found the brain and cord normal macroscopically. Upon microscopical examination the gray substance of the cord from the lumbar region up to the medulla, the pons, and corpora quadrigemina was the seat of small cell infiltration and hemorrhages in places. The

[1] Putman. A Case of Acute Fatal Neuritis of Infectious Origin. Boston Med. and Surg. Journ., 1889, cxx. pp. 159 and 187.

[2] Williamson. The Early Changes in the Spinal Cord in Acute Ant. Poliomyelitis of the Adult. Med. Chron., Manchester, 1890, vol. xii. p. 454.

[3] Klebs. Ueber Landry'sche Paralyse. Deutsch. med. Woch., 1891, vol. xvii. p. 81.

[4] Hlava. Examen histologique d'un cas ayant trait à une femme décédée sous les symptomes de la paralysie de Landry. Arch. boh. de méd., 1891, vol. iv. p. 270. Ref. in Schmidt's Jahrbuch, 1891, vol. ccxxxii. p. 244.

foci were chiefly in the anterior and posterior horns and also in Clarke's column. The white substance was intact. The vessels everywhere were dilated. In the medulla the infiltration involved chiefly the nucleus of the vagus, hypoglossus and glosso-pharyngeus, and also the olives. The sciatic and the ulnar nerves were examined. In both there were numbers of so-called mast-cells in the medullary sheath, but nowhere was there degeneration.

Zusch[1] reports a case in which a change in the color of the white substance of the cord was evident—a change which "would indicate an acute myelitic process." The cord seems to have been examined macroscopically only. The paralysis seemed to be the sudden outcome of a very marked stage of chronic alcoholic poisoning.

E. Leyden[2] reports a case where the spleen was small and firm. There was broncho-pneumonia. The blood contained no bacteria. There was neuritic atrophy in the peroneal nerves, in the right radial, and in the recurrent nerves. The cord, hardened in Müller's fluid, showed some thickened and swollen nerve-fibres, with poorly-staining sheaths. These were most abundant in the lateral columns of the dorsal cord, diminishing above. Between these large fibres were small ones, which Leyden thought compressed. Deiters' cells were enlarged, swollen, with clear nuclei, but not increased in number. There were no compound granule cells. The ganglion cells of the anterior horn were swollen and cloudy, so that it was difficult to make out the nucleus, and the nerve processes were swollen. In a considerable number of these cells vacuoles were seen.

W. Oettinger and G. Marinesco[3] reported a case in which the dorsal and lumbar cord was very soft, with injection of the pia; above, the cord was firmer. The medulla and brain were congested and contained small hemorrhages. The changes in the cord followed the vessels of the anterior fissure principally. The vessel-walls were infiltrated, and the vessels themselves contained thrombi. Occasionally there would be a rupture of the vessel with a small hemorrhage in the gray matter. The nerve-cells showed loss of the protoplasmic granules, rupture of the cell processes, and also true atrophy. The changes were less marked in the cervical cord, where they were practically limited to the anterior horns. The same was true of the medulla, where, however, the affection of the nerve-cells was less. Bacteria, mostly streptococci, were seen in the leucocytes and occasionally in some of the nerve-cells, and a diplococcus was also seen. No cultures were made.

[1] Zusch. Inaug. Diss. Jena, 1894. Quoted in Sajous' Annual of Universal Med. Sci., 1896, vol. ii. B. 18.

[2] Leyden. Ueber mult. Neuritis und acute aufsteigende Paralyse nach Influenza. Zeitschr. f. klin. Med., 1894, vol. xxiv. p. 1.

[3] Oettinger and Marinesco. De l'origine infectieuse de la paralysie ascendante aiguë, etc. Sem. méd., 1895, vol. xv. p. 45.

G. Ballet and A. Dutil,[1] in their case, reported that microscopic examination of the cord stained with hæmatoxylin and eosin showed an enormous dilatation of the vessels of the cord, especially in the anterior horns. The perivascular lymph spaces were infiltrated with leucocytes, and there were occasional hemorrhages. Nissl's stain showed pronounced degeneration of the cells of the posterior horns, of the columns of Clarke, and particularly of those of the anterior horns. These changes consisted of the disappearance of the protoplasmic granules, a swelling of the cells, the separation or rupture of the processes, disappearance of the nucleus, and granular atrophy. These changes were less marked in the medulla. The peripheral nerves showed beginning degeneration. There was little change in the muscles. No bacteria were obtained from cultures, nor were they present in the sections. There was extensive fatty degeneration of the cells of the liver.

P. Marie and G. Marinesco[2] reported a case in which the veins of the pia of the cord were injected. On section the anterior horns were soft and injected. The medulla was more normal, but here there were very evident hemorrhages in the gray substance of the floor of the fourth ventricle and among the root-fibres of the pneumogastric, and occasionally among the hypoglossal fibres. In the brain there were slight pin-point hemorrhages in the gray matter. On microscopic examination of the cord the anterior horns were found to be made up of mononuclear leucocytes, so that the appearance was almost that of an abscess. The leucocytes were disposed chiefly about the bloodvessels. The posterior horn showed only slight infiltration and congestion of the vessels. The nerve-cells, where not completely destroyed, were swollen, and showed loss or fragmentation of the protoplasmic granules, and rupture of the processes from the cells. In the cervical region these changes were less marked, and the same was true of the medulla. A bacillus from 5μ to 12μ in length, articulated end to end, with a clear space between them, with slight enlargement of the free ends, was found in the vessels of the anterior horn, and rarely in the nerve-cells. In the lumbar region this bacillus was not found, but a much shorter organism presenting the form of a "diplo-bacterium." No cultures. No inoculations. The peripheral nerves seemed normal.

Remlinger[3] reports a case in which he found dilatation and inflammation of the vessels of the anterior fissure, and particularly of the branches to the anterior horns. The leucocytes were more numerous in the vessels than normal. He speaks also of the rupture of the cell-

[1] Ballet and Dutil. Paralysie ascendante aiguë symptomatique d'une myélite diffuse ascendante. Bull. et mém. de la soc. méd. des hôp. de Paris, 1895, 3e série, vol. xii. p. 684.

[2] Marie and Marinesco. Sur un cas de paralysie de Landry, etc. Bull. et mém. de la Soc. méd. des hôp. de Paris, 1895, 3e série, vol. xii. p. 659.

[3] Remlinger. Sur un cas de maladie de Landry, etc. Compt. rend. de la soc. de biol. Paris, 1896, 10e série, vol. iii. p. 376; also Méd. mod., Paris, 1896, vol. vii. p. 209.

processes of the ganglion cells. Nissl's method was used. In the anterior horn in spaces between the large cells, probably in the lymph spaces, he found chains of streptococci. There were no bacteria within the nerve-cells. There were no hæmatozoa in the vessels or out of them. The medulla and peripheral nerves were not examined. Pure cultures of streptococcus were obtained from the cervical, dorsal, and lumbar cord. The blood from the peripheral vessels was sterile.

P. Bailey and J. Ewing[1] in their case reported the spleen as enlarged. They found congestion of the bloodvessels of the cord, with exudative inflammation in the anterior horns of the cord and in the medulla. There were vascular and exudative changes in the motor cortex, the basal ganglia, and the cerebellum. There were degeneration of the nerve-cells and vascular changes in the nerve-roots. The peripheral nerves were not examined.

J. Eichberg[2] in his case found congestion of the anterior horns of the cord. There were hemorrhages into the anterior horns, and the tissues about the vessels were infiltrated with round cells. In the lumbar region the process amounted practically to an abscess. In this portion there were no ganglion cells. Higher up in the cord some of the ganglion cells remained, but were altered and surrounded by inflammatory exudation. The alterations were shown by the difference in staining with aniline blue-black, Weigert's, and other stains. There were no changes in the white matter except congestion of the vessels. The membranes of the cord were congested. The anterior nerve-roots were normal. The brain and the peripheral nerves were not examined.

Diller and Meyer[3] reported a case of Landry's paralysis which was normal except that the course was somewhat prolonged (fourteen weeks). They found a diffuse atrophy in the pyramidal tracts, with hyperæmia of the crossed pyramidal tract and increase of the neuroglia. The axis-cylinders of the pyramidal fibres were slightly rarefied. In the anterior horns there was marked pigmentation of the ganglion cells. The nerve-roots were normal. The medulla, brain, and peripheral nerves were not examined.

R. Van der Velden[4] reported a case which is not perfectly typical. In it he says that the legs were stiff, and there was a loss of the electrical excitability of the muscles. The cord showed swelling of the axis-cylinders, with loss of the myelin sheath in various small areas, chiefly

[1] Bailey and Ewing. Contribution to the Study of Acute Ascending (Landry's) Paralysis. New York Med. Journ., 1896, vol. lxiv. pp. 1 and 41.

[2] Eichberg. A Case of Ascending Paralysis, etc. Med. Rec., New York, 1891, vol. xxxix. p. 226.

[3] Diller and Meyer. A Case of Landry's Paralysis with Autopsy. THE AMERICAN JOURNAL OF THE MEDICAL SCIENCES, 1896, p. cxi. p. 404.

[4] Van der Velden. Ein Fall von acuter aufsteigender spinal Paralyse. Deutsch. Arch. f. klin. Med., 1877, vol. xix. p. 333.

in the anterior and lateral columns. There was also some exudation about the vessels.[1]

From a cursory review of the changes found in these autopsies one would almost think that any possible change of the nervous system could cause Landry's paralysis, or no changes at all be required to produce the symptoms. It would hardly seem that it were merely accidental that so many of the cases with negative pathological examination were among the first reported. Without doubt many of these cases if examined with the present methods would have shown definite pathological processes, so that it could scarcely be maintained by any one at the present day that Westphal's criterion of a negative pathological result is necessary in this disease.

Leyden[2] divides Landry's paralysis into: 1. A bulbar or medullary form. 2. A neuritic form. The first, he says, is caused by a process in the cord which extends to the medulla, and is essentially a myelitic

[1] The case of Varnali, in the Romania med. Bucuresci, 1896, vol. iv. p. 20, has been omitted because we were unable to obtain access to the journal; the case of Bristow and Horsley, Brit. Med. Journ., 1888, vol. ii. p. 1110, quoted by Ross, because it was evidently rabies.

The following cases, with autopsy, have also been omitted for various reasons—a few because the pathological examination was indefinite; most of them because the cases were not typical of Landry's paralysis.

Leyden. Allgem. Zeitsch. f. Psych., 1875, vol. xxxii. p. 537. Leroy d'Etiolles, 2d part, p. 97. Quoted by Ross.

Ollivier. Traité des maladies de la moelle épinière, 1837, 3d ed., p. 51. Quoted by Ross.

Kussmaul. Zwei Falle von Paraplegie, etc. Erlangen, 1859.

Leudet. Paralysie ascendante aiguë. Gaz. des hôp., 1861, vol. xxxiv. p. 229.

Bablon. Paralysie ascendante aiguë. Gaz. hebdom., 1864, 2e série, vol. i. p. 806.

Leudet. Sur les troubles des nerfs périphériques. Arch. gén. de méd., 1865, 6e série, vol. i. p. 525.

Bourdillat. Paralysie gén. consécutives a la rougeole. Gaz. des hôp., 1868, vol. xli. p. 5.

Chalvet. Thèse de Paris, 1872; also Gaz. des hôp., 1871, vol. xliv. p. 369.

Duchenne. De l'électrisation localisée, 1872, 3d ed., p. 445. Quoted by Ross.

Gombault. Un cas de paralysie spinal. Arch. de phys., 1873, vol. v. p. 80.

Cornil and Lepine. Soc. de biologie, 1873, vol. v. p. 206.

Calestri. Gaz. Lomb., 1874, vol. xxxiv. p. 20; also in Schmidt's Jahrbuch, 1875, vol. clxviii. p. 18.

Leyden. Ueber Poliomyelitis und Neuritis. Zeitschr. f. klin. Med., 1880, vol. i. p. 414.

Fox. A Case of Acute Ascending Paralysis. Brain, 1880, vol. ii. p. 418.

Finny. A Case of Acute Ascending Paralysis. British Med. Journ., 1882, vol. i. p. 732.

Roth. Neuritis disseminata acutissima. Correspondenzblatt für schweizer Aerzte, 1883, vol. xiii. p. 317.

Vierordt. Multiplen degenerativen Neuritis. Arch. f. Psych., 1883, vol. xiv. p. 678.

Wood and Dercum. Acute Ascending or Landry's Paralysis. Ther. Gaz., Detroit, 1885, vol. ix. p. 157.

Buck. A Case of Landry's Paralysis. Lancet, 1885, vol. ii. p. 12.

Sondeykine. Arch. de Neurol., 1886; also in Centralbl. f. klin. Med., 1887, vol. viii. p. 181.

Pitres and Vaillard. Paralysie ascendante aiguë. Arch. de phys., 1887, 3e série, vol. ix. p. 149.

Lunz and Mamurowski. Quoted in Neurol. Centralbl., 1890, vol. ix. p. 696.

Pribytkow. Soc. of Neuropathologists and Alienists at the Moscow University, Sept. 24, 1893. Neurolog. Centralbl., 1894, vol. xiii. p. 716.

Vranjican. Fall von acuter multipler Neuritis. Wien. klin. Woch., 1895, vol. viii. pp. 485 and 511.

Stephens. Landry's Paralysis, Glasgow Med. Journ., 1896, vol. xlv. p. 5

[2] Leyden. Zeitsch. f. klin. Med., 1894, vol. xxiv. p. 26; and Nothnagel's Path. und Therap., 1897, vol. x. p. 445.

process. The other form he thinks is a purely neuritic one, and in this case he states that changes in the electrical reactions of the nerves and muscles often occur, so he says to the process in the second form of the disease, a polyneuritis, there is joined a parenchymatous œdematous process in the spinal cord, which extends to the medulla and, arriving in the neighborhood of the vital nerve-centres, causes death. He also calls attention to the fact that multiple neuritis in its ordinary course shows several essential differences from Landry's paralysis, and mentions the fact that it usually requires less time in which to develop, that there is but a slight tendency to spreading, and no such constant inclination to affect the medulla. He might also have called attention to the fact that multiple neuritis, when extending, is much more apt not to ascend in so regular and orderly a manner as Landry's paralysis.

Jolly[1] holds practically the same view, but thinks, in addition, that under certain circumstances the cause which produces the injury to the nerve function can act without leaving behind it demonstrable microscopical alterations.

In this connection it is well to remember that Dejerine and Sotta,[2] in a case of chronic polyneuritis of fourteen years' standing, demonstrated pathological changes in the cells of the anterior horn. Ballet and Dutil[3] also reported a case of polyneuritis in which they found the protoplasm of the cells of the anterior horn stained by Nissl's method, homogeneous and swollen, without nuclei or processes. In others the granules were diminished in number, the nuclei were irregular in shape and often at one side of the cell, and there was loss of the nucleolus.

Landry's paralysis must, from its clinical symptoms, necessarily be an affection primarily of the motor neuron of the first order, without involvement of the sensory nervous apparatus. Inasmuch as this motor neuron is both within and without the spinal cord, it is not so strange as it seems at first sight that changes have been missed in the one place or in the other. That changes do occur in the motor cells of the anterior horn in cases of peripheral neuritis can no longer be doubted. The question which concerns us is whether a disease which is purely motor in type should be classed with the ordinary cases of peripheral neuritis in which sensation is usually affected. Certainly Leyden was justified, by the exclusive motor paralysis, the rapid course, and frequent fatal termination of this disease, in separating it from the cases of polyneuritis of more chronic course, with marked pain, sensory disturbances, tenderness of nerve-trunks, and favorable prognosis.

[1] Jolly. Berlin. klin. Wochenschr., 1894, vol. xxxi. p. 281.

[2] Compt. rend de la Soc. de biol., 1896, 10e série, vol. iii. p. 193.

[3] Ballet et Dutil. Sur un cas de polynévrite avec lésions médullaires. Bull. de la Soc. méd. des hôp., 1895, 3e série, vol. xii. p. 818.

That Bernhardt and Westphal were correct in their supposition that the disease is produced by an intoxication seems to be the general opinion. That the pathological changes found should vary in intensity and extent with the severity of this intoxication need not surprise us. The first of the two cases reported in this paper shows that acute ascending paralysis, the affection being practically altogether of the motor neurons, may find its cause in an inflammatory process, most marked in the anterior horns of the spinal cord, with marked changes in the axis-cylinder throughout the remainder of the course of this motor neuron. The case of Schulz and Schultze seems to occupy a middle ground between these two forms of paralysis. From Duchenne's paralysis these cases are characterized by their more rapid course, and probably also by a slighter tendency of the process to involve the posterior roots and the sensory functions of the cord; from disseminated myelitis by the small section of the cord attacked in its transverse section, and by the anterior horns being affected throughout the whole length of the cord. Clinically, the cases should differ also, as certainly the cases of Leyden and Van der Velden, which are probably of this nature, differ from the typical cases of Landry's paralysis.

Practically these cases come very near the cases of acute anterior poliomyelitis of children, differing from them in that the process is much more generalized over the motor tracks both of the cord and medulla, this latter, as is well known, being seldom affected in the infantile form. So close, indeed, is the resemblance, that Bailey and Ewing, in their paper, have included in their tables six cases reported as acute anterior poliomyelitis occurring in children, because of the extent of the paralysis and the presence of bulbar symptoms which were severe enough to cause death. Practically, one may admit that they were justified in classing these cases with the severe type of Landry's paralysis, such as theirs, that of Marie and Marinesco, that of Oettinger and Marinesco, and the first case reported in this paper. Probably the case of Eichberg also belongs here. In this severer form the process consists of a dilatation of the vessels, with round-cell infiltration of their walls, accompanied by degenerative changes of the motor cells of the anterior horn and their processes. If the pathological process is still more acute the anterior horn may almost resemble an abscess; the normal structure of the gray matter being replaced by an inflammatory product, consisting of large and small lymphoid cells, of compound granule cells (vesicular leucocytes), and the detritus of the degenerated nerve-cells and processes. At times bacteria of different varieties may be present in this inflammatory process itself. More frequently, as in the cases reported in this paper, the examination of the sections for micro-organisms and of the cultures is negative.

The second case seems at first glance to differ entirely from the class

of cases which we have just been considering. The examination of the cord by the ordinary methods shows practically no changes, and we should probably not go far wrong if we assume that this represents one of those cases which, in the earlier reports, have been described as without pathological changes. Nevertheless, upon more careful examination by means of Lenhossek's and Nissl's methods, distinct degenerative changes were found in the motor cells, as shown by the disappearance of the chromophilic granules of the protoplasm and the changes in the nucleus and nucleolus. In both cases degenerative changes were found in the axis-cylinders of the peripheral nerves. Probably in these cases we have again to do with a degenerative process confined to the motor neuron of the first order produced by an intoxication of some sort. We must admit that similar changes have been found both in the cells and in their processes, in cases which clearly belong to polyneuritis. The fact that the course of Landry's paralysis differs so markedly from an ordinary case of neuritis, that the sensory neuron is so little if at all affected, and that the tenderness of the nerve-trunks to pressure is absent or slight, seems to justify us in retaining this collection of symptoms as forming a separate disease, clinically at least.

If this conception of Landry's paralysis as a degenerative process of the peripheral motor neuron, with or without the presence of an exudative inflammatory process in the anterior horns of the cord, be correct, the absence of the reaction of degeneration in the muscles affected can only be explained by the short duration of the disease, and the same is true of the absence of atrophy; so that one is compelled to attach less importance to the absence of these symptoms than has hitherto been done, while the absence of sensory changes acquires increased importance.

Analysis of the reported cases as to the cause shows that in a great many none could be ascribed, nevertheless in a considerable number of cases acute ascending paralysis followed closely upon some infectious disease, such as smallpox, diphtheria, or typhoid. The presence of an enlarged spleen and of swelling of the mesenteric lymph glands, which is so often noted in the autopsies, confirms this view. It has been said that we may expect to find some micro-organisms present in the nervous structures, but more often it is probable that the micro-organisms producing the poison will be found in some other part of the body. Inasmuch as nerve-cells react in much the same way to various poisons, further research will probably show that in these cases micro-organisms are not always present, but that the intoxication may be produced through faulty metabolism or by the absorption of poisons from without. That toxic substances may act in a selective manner, affecting only the motor neurons, is difficult to explain, although we are not without other instances of the same action, as, for example, the almost

pure motor trouble in lead paralysis, which, in this case, as is well known, has a special predilection for the motor nerves and for those going to the extensor muscles of the forearm.

THE USE OF ANIMAL TOXINS IN THE TREATMENT OF INOPERABLE MALIGNANT TUMORS.[1]

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The Cure of Malignant Disease by Accidental Erysipelas. Early in the seventeenth century, according to Fehleisen, it was known that not only malignant growths, but certain chronic ulcers, lupus and syphilitic destructive lesions, were arrested, and in some instances absolutely disappeared following an invasion of erysipelas. In modern times Billroth called attention anew to the subject, by reporting a case of inoperable sarcoma of the pharynx cured by an attack of facial erysipelas.

There has been some dispute as to the authenticity of such cases, but it must be admitted that while it is very difficult to verify at this late day the assertion that all the cases denominated true sarcoma were in reality examples of that disease, yet it is going too far to say that all of the accounts bearing upon the question are absolutely untrustworthy. Nor will it suffice to declare the occurrence of the erysipelas and the disappearance of the growths as merely coincidental. The theory of spontaneous disappearance of the growths as a coincidence in the course of or following an attack of erysipelas falls at once to the ground in the face of the fact that the spontaneous disappearance of growths which, even with the limited knowledge of pathology at the command of our predecessors, could have been mistaken for malignant disease, is absolutely unknown. Moullin,[2] in investigating this subject in a most conservative, painstaking, and impartial manner, was able to identify fifteen undoubted instances of sarcoma in which an attack of erysipelas occurred. Of these, in no less than nine all evidences of the growth disappeared, and in some instances no recurrence had taken place for seven years. As corroborative evidence of the influence of the erysipelas it may be said that, of the remaining six cases, five showed a decided lessening in the size of the growth.

The cases reported by Billroth,[3] Busch,[4] Biedert,[5] Plenno,[6] Bruns,[7]

[1] Presented at the meeting of the American Surgical Association at New Orleans, April 20, 1898.

[2] The Lancet, February 5, 1898.

[3] Senn: The Journal of the American Medical Association, July, 1895, p. 131.

[4] Berliner klinische Wochenschrift, 1866, No. 23.

[5] Deutsche med. Zeitung, 1895, No. 4.

[6] Archiv f. klin. Chirurg., 1886, Bd. xxxiv. p. 688.

[7] Beitrage zur klin. Chirurg.

Coley,[1] Winslow,[2] Stein,[3] Klieblatt,[4] Fehleisen,[5] and Wyeth,[6] in all of which the growths were either markedly diminished in size, softened, or disappeared altogether, under the influence of the infection of erysipelas, should leave no doubt in the mind of any reasonable person that malignant disease is influenced in a remarkable manner by the presence of this disease.

Répin[7] collected twenty-one observations of modified or cured tumors by accidentally acquired erysipelas. Among these 11 were one or another of the varieties of sarcoma, viz., 6 round-celled sarcomas; 3 lymph-sarcomas, and 2 melanotic sarcomas. Of this number 6 were permanently cured. In 11 other cases of malignant tumors the amelioration was only temporary. In 5 of these epithelioma was the disease; in 6 apparent sarcoma of diverse histological variety. A study of these reveals the fact that the effect of an erysipelas in the neighborhood of a tumor is to produce in the latter signs of necrosis; softening occurs in subcutaneous tumors, followed by a sinking away from the surface and atrophy. Pre-existing ulcerative conditions of the tumor are followed by sloughing away of portions of the growth in fragments. Some, particularly glandular growths, suppurate. In all of the eleven cases the destruction of the neoplasm was but partial and the arrest only temporary. The growth soon resumed its encroaching and progressive invasion of the surrounding tissues.

The remarkable effects of erysipelas upon malignant growths, including changes involving necrosis, atrophy, and even radical cure, have been observed even in cases in which the erysipelas has been located at a point distant from the site of the tumor.

The good effects of accidental erysipelas in this class of cases has for some time suggested the idea of bringing about this disease as a therapeutic resource. Ricord attempted to elevate it to a method in the cure of obstinate syphilides, but the use of the remedy was too dangerous to be justified in the cure of disease amenable to other treatment.

When the isolation of the microbe of erysipelas was discovered by Fehleisen, the latter sought to provoke erysipelas at will in patients the subjects of inoperable malignant tumors. It was soon shown that inoculations of pure cultures of the streptococcus erysipelatis gave results quite comparable to those following accidental erysipelas.

Fehleisen[8] succeeded five times in producing erysipelas in subjects of malignant tumor. He obtained a cure in a case of carcinoma of the breast, and in four other cases (two sarcomas and two carcinomas) there

[1] The American Journal of the Medical Sciences, 1893, p. 487.
[2] London Medical Recorder, 1884.
[3] Vratsch: St. Petersburg, 1882, No. 16.
[4] Münchener med. Wochenschrift, 1890, No. 7.
[5] Des Erysipel., Berlin, 1888.
[6] Journal of the American Medical Association, 1894, p. 985.
[7] Répin: Revue de Chirurgie, 1895, p. 466.
[8] Op. cit.

was a partial necrosis, or a temporary atrophy of the tumors. The same result was obtained in a similar case in the hands of Holst.[1]

Coley[2] succeeded in producing typical erysipelas only three times out of ten trials. One of his cases was that of a man, aged forty years, with sarcoma of the lower lumbar region and groin. The groin tumor was removed by operation, but recurred in four weeks. He was then inoculated with erysipelas, as a result of which both the tumors disappeared. Three months later, however, recurrence took place, which was followed by a second inoculation, and again the tumors disappeared. Another recurrence took place. Inoculation was again attempted and a very decided reaction followed, but erysipelas failed to appear, although the tumors decreased in size. A week later, however, a spontaneous attack of erysipelas occurred in the same region as the last, and during the three weeks following two similar attacks occurred, though milder in type.[3]

The first of these was a striking case of sarcoma of the tonsil and secondary involvement of the structures in the neck. The latter had been operated upon three times prior to this. Fehleisen's method of inoculation by scarification was attempted, but proved unsatisfactory, and one-half to two grammes of bouillon cultures were injected into the neck tumor, with the result that, although no attack of erysipelas occurred, and but slight reaction followed the injections, improvement followed. This, however, ceased, and the tumors began to increase in size, when the treatment was discontinued. A new and more virulent culture was obtained and a severe attack of erysipelas followed its injection. This was followed by disappearance of the tumor in the neck.[4]

The particular striking feature of these observations is the constancy of the effects produced both by Fehleisen and Coley. Whenever a decided erysipelas was produced an effect upon the tumor was observed.

In future studies of the subject it may be possible, following Neelsen, to obtain histological examinations of the growths when undergoing destructive metamorphosis.

The Use of the Septic Products of the Streptococcus Erysipelatis. The method of direct inoculation by scarification of Fehleisen, and the injection of bouillon cultures of Coley, found very few followers, this doubtless being due to the only partial successes as well

[1] Annales de l'Institut Pasteur, 1888, p. 243.

[2] The American Journal of the Medical Sciences, May, 1893.

[3] This case was finally treated and a permanent result obtained by the employment of the toxic products of erysipelas and bacillus prodigiosus. The American Journal of the Medical Sciences, September, 1896, p. 258.

[4] This patient was examined in September, 1895, within a month of four years following the last inoculation, and nothing was to be seen upon the neck save the scars resulting from the former operations. The tumor of the tonsil was still present, although it had shrunken in size and lost its malignant features.

as the dread of provoking a mortal disease. The fatal cases of Janike,[1] Neelsen,[2] and Coley[3] emphasize this. These facts, added to which was the difficulty of preserving the virulency of the streptococcus, contributed to cast discredit upon the method.

Following Brieger and Frankel's discovery, Lassar,[4] of Berlin, in 1891, employed the toxic products of the germs alone. The method of filtration was employed to separate the germs from the toxins, after which the latter were sterilized by steam. After several injections practised on himself by his assistant, Friedlander, and also upon animals, the inoccuity of the material was demonstrated when it was injected into the nodules of an epithelioma of the face which had followed lupus. Doses of 25 c.c. of the culture were employed. Toleration of the injection was reached before any favorable influence upon the growth was obtained, and the attempt was abandoned. The effect upon the neoplasm, save a trifling irritation, was absolutely *nil*. Lassar was followed by Spronck,[5] of Utrecht, Holland, who likewise believed that sterilized cultures would attain the same end as living and virulent micro-organisms. Uncertain as to the best methods of accomplishing this end, and believing that cultures sterilized by filtration and those sterilized by heat united different properties, he employed a mixture of the two liquids. For media culture he employed the bouillon of meat, bouillons of peptonized beef, white of egg, and serum of beef. His experiments were carried on with cultures of different ages made at varying temperatures, and either in the presence of air or partially or entirely in oxygen. Five per cent. of glycerin was added to the bouillon cultures and the fluid evaporated to one-tenth of its volume. Those sterilized by heat were heated to 100° C., and those sterilized by filtration were filtered through porcelain.

Spronk carried on experiments upon animals as follows: The filtered liquid was injected into the veins of rabbits in doses of from 10 to 15 c.c. per kilogramme of the weight of the animal. Death occurred in from twenty-four to forty-eight hours. Varying effects were observed according to the virulence of the streptococcus which furnished the cultures, as well as the degree of susceptibility of the animal.

Dogs affected with tumors were treated by this method. In the case of a dog affected with a tumor the subcutaneous injection of the liquid in larger proportionate doses produced no untoward symptoms. Some redness and transient swelling took place at the point of injection, but no suppuration nor necrosis occurred. The subcutaneous injection of several c.c. produced a slight and irregular elevation of temperature.

[1] Centralblatt f. Chirurgie, 1884, p. 55. [2] Loc. cit, No. 44.
[3] THE AMERICAN JOURNAL OF THE MEDICAL SCIENCES, May, 1893, p. 506.
[4] Deutsche med. Wocheuschrift, 1891, No. 29.
[5] Tumeurs malignes et maladies infectieuses, Annales de l'Institut Pasteur, 1892, p. 883.

Gradually increased doses, administered with several days between, did not produce general symptoms of poisoning.

In the case of two of the animals, repeated subcutaneous injections practised at a distance had no effect upon the tumors, as shown by an examination of the latter after removal. The tumor in one of these experiments was an epithelioma in the anal region. The other was a lipoma of the mamma.

In five other dogs the changes in the tumors were more marked. Following injections practised at a distance and in increasingly large doses the tumors took on a livid violet color, with increased heat; in two cases the growths became painful upon palpation. The injections being continued, softening and necrosis of the neoplasm began. In two cases these alterations occurred with astonishing rapidity.

Ablation of the remaining portions of the growths was then practised. Microscopic examination of these showed that the tumors had undergone localized alterations only. The histological varieties embraced two sarcomas and three epitheliomas. In isolated points fatty degeneration with islets of necrosis and infiltration of the polynuclear white blood-corpuscles was found. Cells the seat of indirect division were rare. These alterations did not differ materially from those frequently found in malignant growths.

One of the most interesting and conclusive of Spronck's observations is the following:

A large but cachectic cart-dog presented a tumor of hard consistence, and the size of a child's head, upon the right shoulder, which constituted a local recurrence of a small tumor that had been removed by operation a year previously. The exact nature of the primary growth had not been determined. Upon the fourth day of treatment a slight swelling of the tumor was noticed, together with some discoloration, and increased heat and tenderness as well. The growth softened and presented isolated fluctuating areas, with well-defined outlines. This softening process went on until at the end of three days the entire tumor was converted into a liquid mass covered by the intact skin. Incision gave exit to a puriform fluid containing the débris of the broken-down tumor and a large number of leucocytes. The animal died, and the post-mortem examination revealed only a small fragment of the tumor attached to the skin remaining. The microscopical examination of this showed the growth to be adenosarcoma.

The clinical symptoms presented by the animals as a result of the presence of the erysipelas, as detailed by Spronck, and their resemblance to those present in man as a result of the injections, are of the most indubitable character.

Twenty-five subjects with inoperable malignant tumors were treated by Spronck up to the time of his report. Unlike Lassar, he employed the injections at a distance from the tumors. Of these 8 were cases of

sarcoma, among which were 2 of melanosarcoma. The remaining 17 cases were carcinomas, viz., 6 of the breast, 1 of the parotid gland, 7 of the tongue or buccal cavity, and 3 of the skin. The injections were made in the subcutaneous cellular tissue, and by preference in the lumbar region. The culture fluid, from one to two-tenths of a cubic centimetre, was diluted with normal salt solution. The dosage was increased more or less rapidly, according to the reaction; in some instances a dose of several grammes was reached.

Following the injections, first elevation of temperature, and then other phenomena took place, these varying with the dosage. Lancinating pains took place, particularly in primary growths, but were also observed in large secondary tumors of regional recurrences, as well as in some metastatic growths. On the other hand, in small secondary growths patients did not feel the slightest sensation. In several cases these pains made themselves felt two or three hours following the injections, and disappeared on the following day. Increased sensitiveness of the growth was noted during this time. In three cases there was slight tumefaction, with heat and redness. These symptoms were more noticeably marked in the sarcomas than in the carcinomas. The most marked reaction was observed in a patient the subject of a number of metastatic tumors which developed following the extirpation of a small primary alveolar sarcoma of the skin. The injections, although carried on in small doses, were followed by swellings and softenings so intense that, under the influence of a fear excited by the first statements concerning the dangers of the use of Koch's tuberculin, the treatment was abandoned.

As to the final therapeutic results: In a majority of cases the growths were not modified. In others they seemed to yield somewhat, while in a small proportion of cases a complete arrest took place; in a small number of the latter some diminution in the volume of the tumors was noticed. In cases of multiple tumors all of the latter were not influenced to the same extent, although some disappeared completely. In no case was a patient entirely relieved of all his tumors, and in instances where amelioration was marked this proved to be only temporary; the neoplasms began to grow again in spite of a continuation of the treatment, a seeming toleration of the toxins being established.

Among the carcinomas only one, that of the breast with involvement of the axillary glands, was markedly influenced by the treatment. The glandular involvement disappeared almost completely, only to reappear.

Examination of tumors extirpated after a series of injections was made in five cases. In one case, that of a melanosarcoma, comparisons were made between tumors extirpated before commencing the treatment and their removal after a number of injections. The latter presented

marked changes, these consisting of a flabby, wrinkled appearance, and a decided tendency to greater contraction when placed in alcohol. They were likewise less rich in small cells and in mitoses than the first. In some localities the characteristic cells of sarcoma had disappeared, nothing but the connective-tissue framework of the tumor remaining, this containing pigmentary granulations and some leucocytes.

Spronck came to the conclusion, as a result of his experience, that the therapeutic action is not sufficiently demonstrated. It was shown, however, that the toxic products of streptococcus erysipelatis when absorbed from the subcutaneous connective tissue, both in man and in animals, lead to alterations tending to necrosis and to the absorption of the neoplasms.

Prior to this Coley had observed that even in cases in which erysipelas was not produced by attempts at inoculation, notable improvement in the growth followed the injections of bouillon cultures. This naturally suggested that the curative action might be due in whole or in part to the influence of the toxins rather than to the germ itself. If this should prove to be true, a great advance would have been made, since the treatment would be robbed of many of its dangers, and the dosage better regulated by substituting the toxins for the infecting agent itself. The advantages of a methodical treatment over a hap-hazard and dangerous experimental inoculation of a not infrequently uncontrollable disease were at once appreciated. The effects of the toxins would be under control, to some extent at least, as compared to the disastrous and untoward results of turning loose upon the patient the virulent streptococcus erysipelatis, with all its local and metastatic possibilities, to say nothing of the dyscrasial effects from toxins, the production and dissemination of which would be in proportion to the extent of a too often uncontrollable local environment.

Like Lassar and Spronck, Coley was doomed to disappointment. Attempts to obtain results after sterilization of the bouillon cultures by steam heat to 100° C., produced toxins too feeble in their effects for use, and filtration though the Kitasato filter still further lessened their efficiency.

Répin's[1] experiments were carried on in the service of Périer, in Paris. Cultures were obtained from two different sources, the one from a fatal case of erysipelas, 1 c.c. of the culture of which injected subcutaneously into a rabbit proved fatal. The other specimen was obtained through Marmorek from Metchnikoff's laboratory. The virulence of the latter was reinforced by being passed a number of times through rabbits until finally it killed the animal in doses of one-tenth of a drop administered subcutaneously. This virulency is only equalled by that of the bacillus

[1] Op. cit.

anthracis. The culture medium employed by Répin was a bouillon of malt peptone and the serous fluid of hydrocele. The cultures were made in vacuo, and were carried on from three weeks to a month. Some were neutralized several times in the course of the growth. The culture liquids were sterilized either by heat or filtration through porcelain. In some instances fractional sterilization was employed after filtration through porcelain.

The effects of these cultures were carfully studied by Répin. When injected into the subcutaneous cellular tissue, even in the smallest dose, a burning sensation was complained of which lasted for several hours. At the end of two or three minutes an area of erythema appeared which persisted for several days. Upon the day succeeding a small, hard nodule, varying in size from that of a pea to a cherry, was found in the œdematous area, if the fluid employed was concentrated. The margins of the erythematous area were generally diffused, although in one case where the injection was made in the thigh this was absent, with a progressive tendency to extension, thus simulating a typical erysipelas. No germs, however, were present in the fluid employed, and the same liquid was employed that had been injected both previously and subsequently upon the same patient without the occurrence of this symptom. More or less sensitiveness remained at the point of injection for a long time.

In order to diminish the latter Répin diluted the toxin and devised an apparatus whereby the diluted culture fluid was slowly introduced into the subcutaneous cellular tissue, the local action being thus distributed over a large surface. Under these conditions the erythema failed to appear, but painful and extensive œdema occurred.

Owing to the inconveniences arising from the subcutaneous method, Répin employed intravenous injections. These were not followed by any local disturbance, and at the same time a more prompt and decided as well as uniform general reaction was obtained.

The intensity of the general reaction obtained varied with the dose and the method of administration. The first noticeable symptom was a rigor. When the injection was made subcutaneously a larger quantity was required to produce the effect than when the intravenous method was adopted. Several centimetres were required in the former case, while a few drops were sufficient in the latter. The vascularity of these tumors explains the ease with which reaction can be produced by Coley's method of interstitial injection, this latter being quite analogous if not identical with the intravenous method. This rigor appears from fifteen minutes to two hours after the injection, and it rarely lasts longer than thirty to forty minutes.

The symptom of elevation of temperature likewise depended upon the dose. This followed the chill after from three to six hours, if the

latter occurred, and in some instances reached 40° C. The fever lasted from eight to ten hours. It was accompanied by the usual correspondingly increased pulse-rate and frequency of respiration.

Cephalalgia sometimes occurred, as well as some nausea and slight vertigo. Labial herpes, sweating in the palms of the hands, and fugacious erythematous eruptions were observed in some cases in which fever was well marked.

Estimates of the amount of urea showed this at times to be somewhat lessened; albumin was not found at any period.

Examinations of the blood made ten minutes after the intravenous injections showed a slight diminution in the number of leucocytes present. The subcutaneous injections were followed by no change in this respect. Leucocytosis was occasionally observed, this being more noticeable after the intravenous injections.

Emaciation supervened very rapidly upon the use of large doses. One patient lost 5 and another 5½ kilogrammes in the first week. In proportion as the treatment is pushed this becomes more pronounced. This, according to Répin, need excite no alarm, and should not constitute sufficient justification for discontinuing the treatment if the latter is found to possess a therapeutic value.

The occurrence of small abscesses at the seat of puncture occurred with no greater frequency than with ordinary hypodermic injections. Répin calls attention to a special accident, namely, collapse following a sharp chill, intense headache and cyanosis. He attributes this to the accidental puncture of a vein while employing the dosage appropriate to a subcutaneous injection, this, of course, being largely in excess of that permissible for an intravenous injection. He asserts that this was shown in one of his cases in which these symptoms followed the injection by the fact that a flow of blood followed the withdrawal of the needle. The remedy suggested by this accident is either to distribute the amount employed for a subcutaneous injection over a large area through several punctures, or, better still, to adopt the method of intravenous injection with the dose appropriate to that method.

In experimenting with heat-sterilized cultures it was found that when these were heated to 100° C. or more, the streptococcus toxin was considerably weakened. Three centimetres heated to 100° C. for ten minutes did not produce elevation of temperature above one degree, and but slight reaction. Six drops of the same liquid given by the intravenous method produced a slight rigor at the end of three-quarters of an hour and an elevation of temperature of one and a half degrees. The injection of a culture containing the micro-organisms, in which the latter had been destroyed by being subjected to a temperature of 80° C. for half an hour, did not prove more effective than the same volume of the decanted fluid.

Répin's clinical observations were made in connection with Dr. Courtin and embraced four cases, three of which were sarcomas and one a mixed tumor.

The first case, a sarcoma of the posterior thoracic wall, which had twice recurred after removal, was treated by twice-daily subcutaneous injections, commencing with ten drops and reaching 105 drops finally, made at a distance from the tumor, for three weeks. A single intravenous injection was then given. The tumor was then modified in some important particulars, but the action of the toxin seemed to cease, and no final result was obtained. The tumor increased rapidly in size and finally invaded the pleura.

The second case was that of a woman with a recurrence of a "mixed tumor" in the submaxillary region, with glandular involvement. The injections produced lancinating pains in the tumor, but no objective modifications in the latter were observed.

The third case was a round-celled sarcoma. Thirteen intravenous injections, commencing with ten drops and ending with forty drops, were given. No influence upon the tumor.

The fourth case was that of a man with an enormous sarcoma of the thoracic wall of probable periosteal origin. The case was treated by the continuous subcutaneous injection method. No alterations in the growth were noticed, and but slight reaction. This was continued for a fortnight. The patient lost 5 kilogrammes in weight. Interstitial injections in the tumor were then resorted to, but these did not prove more efficacious.

THE USE OF THE MIXED TOXINS OF THE STREPTOCOCCUS ERYSIPELATIS AND THE BACILLUS PRODIGIOSUS. It was not until the discovery of Prof. Roger, of Paris, that the addition of a non-pathogenic micro-organism, the bacillus prodigiosus, to cultures of certain pathogenic organisms greatly enhanced the virulency of the latter, that another advance was made in the treatment of inoperable malignant tumors by erysipelas and its toxic products. Among the organisms, the virulency of which was increased by the prodigiosus, was the streptococcus erysipelatis of Fehleisen. As far as could be ascertained the addition of this organism did not furnish to the cultures any specific action of its own.

Following Roger's discovery both living and sterilized cultures of the bacillus prodigiosus were employed for the purpose of inducing the development of a pathogenic micro-organism in animals relatively immune to the latter. In this connection are to be noted particularly the experiments of Vaillard,[1] Rouget,[2] and Roux,[3] who successfully inoculated the guinea-pig with tetanus, an animal ordinarily insusceptible to

[1] Vaillard: Ann. de l'Inst. Pasteur, Paris, 1892, vi. 676-682.
[2] Rouget: Arch. de physiol. norm. et path., Paris, 1894, 5 S., vi. 397-411.
[3] Roux: Ann. de l'Inst. Pasteur, Paris, 1893, vii. 65-140.

this disease, by combining the two organisms in the inoculation. This method apparently favors the development of the pathogenic bacillus by supplying for it a protection against the action of the phagocytes during the first few hours following the inoculation. It is claimed by Répin, however, that this action refers only to the living streptococcus and not to the toxin of the latter. He asserts that if in the hands of some observers the mixed cultures have produced a greater reaction it is because the bacillus prodigiosus itself exercises a toxic influence upon man not usually attributed to it, but that it does not necessarily follow that it exercises the same influence upon tumors as that following the reaction from the streptococcus. His method, therefore, is to employ pure cultures of the streptococcus in progressively increasing doses.

Coley, however, adopted the method of strengthening the bouillon cultures of streptococcus suggested by Roger's discovery. He very soon demonstrated its efficiency, and succeeded in obtaining more satisfactory results by mixing together the most virulent streptococcus culture obtainable with that of the prodigiosus in the proportion of four of the former to one of the latter, sterilizing the mixture by filtration and preserving it by the addition of a few crystals of thymol. Cultivation of both germs in the same fluid was subsequently resorted to, and sterilization by heating to 50° to 60° C. substituted for filtration. While this permits the germs themselves to remain in the fluid, exposure of these to the above temperature is sufficient to render them sterile. The method employed in the preparation of Coley's fluid is essentially as follows:

Sterilized peptonized bouillon is inoculated with a culture forty-eight hours old, the original source of which was a fatal case of erysipelas, and the continued virulency of which has been assured by passing it through rabbits as follows: The ear of the animal is freed from hair and sterilized by washing with weak carbolic solution, followed by sterilized water. A small quantity of bouillon culture of the germ forty-eight hours old is then injected in several places in the ear. At the end of forty-eight hours the ear is again sterilized and washed, and a culture taken by introducing a stout platinum needle beneath the skin in the infected area, when the layer of skin is cut out and lifted away with the needle. The piece of skin is then used to inoculate an agar tube. If the agar is prepared with 75 per cent. of bouillon and 25 per cent. of fresh urine the growth of the colonies of streptococci will be increased. The inoculated agar tube is then placed in an incubator. At the end of twenty-four hours colonies of streptococcus will appear upon the surface of the agar. From these colonies pure cultures of the organism are obtained to inoculate the peptonized bouillon.

The best method of making the bouillon is to employ well-chopped beef, a pound of which is to be covered with water and allowed to soak

overnight. It is then strained through a cloth and the quantity made up to 100 c.c., when it is boiled for one hour. It is again strained, and salt and peptone added, and again boiled for an hour. The fluid will now pass through filter-paper perfectly clear, and after filtering is ready for the flasks. It need not be neutralized.

The peptonized bouillon is placed in small flasks, each containing from 50 c.c. to 100 c.c., and sterilized. It is then inoculated from the colonies upon the surface of the agar tubes, and the growth of the germ carried on for three weeks at a temperature of 30° to 35° C., after which the flask is inoculated with the bacillus prodigiosus. The fluid is then exposed to room-temperature for another ten days, when, after being thoroughly shaken, the cultures are transferred to sterilized glass-stoppered bottles. Sterilization is accomplished by exposing these to a temperature of from 50° to 60° C. for an hour.

All of Coley's patients have been treated by interstitial injections into the tumor itself. This circumstance rather enhances the value of the evidence derived from these cases. While it is true that decided effects can be produced by irritating substances substituted for the toxins, such, for instance, as turpentine, as practised by Krynski, of Krakau, still the fact is settled that these are not of a curative character; further, they have no elective action upon the tumor when injected at a distance and producing the same effect, as in the case of the toxins. Once the specific action of the toxins is admitted it is highly probable that this should be exerted more energetically *in situ* than when injected at a distance.

In using the injection it is to be borne in mind that the patient may be either more than ordinarily susceptible to the action of the toxins of the germ, or he may be comparatively immune. Hence in the commencement of the treatment the dose of two minims should be employed. Dr. Coley has seen a temperature of 105° F. follow the use of this quantity. While it is true that the more decided the reaction, as shown by the temperature, the better the outlook for a favorable influence upon the disease, it is not desirable that this should exceed 103° to 104° F. This is surprisingly well borne. In several instances, in spite of great depression following excessive reaction, the patient's general condition markedly improved.

The dose of the above preparation of Coley may be carried up from a half to eight minims, according to the reaction. Glycerin or sterilized water may be used for diluting the solution. If the filtrate is used the initial dose should be double that selected when the unfiltered toxins are employed. The injections may be made in the tumor itself, although it is probably safer to inject subcutaneously at first, as a larger dose will be borne if this method is employed. The injection of the toxin solution directly into the structure of a vascular tumor leads to a more rapid

absorption, and in a very feeble person may give rise to depression so great as to prove fatal. A case is reported by Moullin, that of a feeble old man with an enormous and very vascular tumor of the femur, in whom, following a first injection with no marked result, a second injection was made in the tumor itself. The injections were made two days apart. Following the second injection a rigor occurred, followed by such extreme prostration that the patient never rallied. Moullin states that the second injection in all probability entered a vein.[1]

In the absence of excessive reaction or great debility the injections may be given daily, with the expectation of obtaining two or three well-marked reactions during the week. With the occurrence of marked diminution of the growth, frequency of the injections may be diminished.

Of course, it will at once be recognized that a patient, even if not completely immune at the commencement of the treatment, may become so after the injections have been continued for a certain length of time, in spite of the addition of the bacillus prodigiosus. As a result of the experience of those who have employed the method and studied its effect, it has been found that a trial of from two to three weeks will demonstrate either that some benefit will result from its use, or that it is useless to continue the treatment longer. Where apparent benefit results from the treatment and there is no contraindication to its continuance, it may be kept up for three or four months, with occasional intervals of rest for three or four days.

In response to a letter of inquiry to Dr. Coley, I am indebted to him for the following:

"First, in regard to carcinoma, I have never advised the toxins in carcinoma except in a tentative and experimental way. My experience, based upon sixty cases, has led me to the following conclusions:

"The inhibitory action in carcinoma—including epithelioma—is in many cases very marked, as shown by cessation of growth, diminution in size, and even disappearance of small nodules. The majority of cases, however, show very little if any improvement. One case, a twice recurrent carcinoma of the breast of rapid growth, demonstrated the inhibitory action beyond question. The disease apparently disappeared. Small doses, insufficient to produce a marked reaction, were administered about twice a week almost continuously for two and one-half years, the patient gained in weight, and health was restored. At the end of two and one-half years there was a slight local return apparent in the region of the pectoral muscle. The treatment was left off for a period of five weeks during my vacation. On returning I found that a tumor, the size of a hand, had developed with enormous rapidity. In a few weeks there was evidence of recurrence in the liver and abdominal organs, and the disease advanced very rapidly, producing death in five months. The carcinomatous nature of the growth had been demonstrated by repeated microscopical examinations.

[1] Op. cit.

"The case of epithelioma of the chin and floor of the mouth, your own case, remains well, now upward of three years. The diagnosis in this case, as you will remember, was made from frozen sections, and, although the clinical evidence strongly supports the microscopical, some will undoubtedly question the diagnosis. This latter is the only case in which the disease remained in abeyance sufficiently long to classify it as a cure.

"In view of these results, as I have stated, I practically advise the treatment only in sarcoma.

"With reference to *sarcoma*, my successes thus far are briefly as follows:

"CASE I.—Spindle-celled sarcoma of the neck and tonsil, treated with the living streptococcus. Well six years.

"CASE II.—Sarcoma of the back and groin, mixed-, round-, oval-, and spindle-celled. Entire disappearance. Well for three and a quarter years, when a recurrence took place in the mesenteric glands and liver, causing death eight months later.

"CASE III.—Sarcoma of the abdomen or pelvis, spindle-celled. Entire disappearance. Perfectly healthy at present, five years later.

"CASE IV.—Round-celled sarcoma of the iliac fossa. Almost entire disappearance. Patient well one year later.

"CASE V.—Spindle-celled sarcoma of the abdominal wall. Entire disappearance. Well four and one-half years later.

"CASE VI.—Spindle-celled sarcoma of the leg and popliteal space. Entire disappearance. Well one and one-half years. Recurrence. Amputation of the thigh. Recurrence in gluteal region. Partial operation, continued treatment with toxins. Disappearance. Patient well at present, five years from the beginning of the treatment.

"CASE VII.—Spindle-celled sarcoma of the chest-wall of enormous size. Entire disappearance under three months' treatment. Patient well three years later.

"CASE VIII.—Angio-sarcoma of the breast, round-celled. Diagnosis made by Dr. Prudden. Entirely inoperable tumor reduced in size so that it was easily removed. Patient well about one year later when lost sight of. This case was treated with erysipelas and bacillus prodigiosus serum as well as with the toxins.

"CASE IX.—Recurrent spindle-celled sarcoma of the palm of the hand and wrist. Entire disappearance. Slight recurrence one and one-half years later. At present under treatment; tumor rapidly decreasing in size.

"CASE X.—Sarcoma of the anterior portion of the sacrum, probably osteosarcoma. Diagnosis—clinical—not confirmed by microscopical examination. Rapid emaciation; cachexia; loss of weight, thirty-five pounds in three months; lameness and excruciating pain made clinical diagnosis practically certain. Entire disappearance of the tumor with a return to normal weight after three months' treatment. Patient in perfect health two and three-quarters years later.

"CASE XI.—Sarcoma of the pectoral region and axilla, spindle-celled. Diagnosis confirmed by Drs. Denham, Buxton, and Welch, of Johns Hopkins Hospital. Entire disappearance from seventy-eight injections. Patient shown before the New York Surgical Society, November, 1896. Patient perfectly well two and one-half years after treatment. In this case the treatment was carried out by Dr. Storrs, of Hartford, under my direction.

"CASE XII.—Round-celled sarcoma of the mesentery involving the liver and small intestine. Clinical diagnosis made by Dr. Willy Meyer at the German Hospital and confirmed by microscopic examination by the pathologist. Patient well three years later.

"CASE XIII.—Twice recurrent round-celled sarcoma of the lip—a little girl, five years of age. Disappearance. Patient well one and one-quarter years later.

"CASE XIV.—Spindle-celled sarcoma of the abdominal wall. Entire disappearance from two months' treatment. Patient perfectly well when last seen, six months later.

"CASE XV.—Enormous chondrosarcoma of the ilium. Disappearance; restoration to health; well until seven months later, when tumor recurred and continued to grow with fatal issue ten months after.

"CASE XVI. — Three times recurrent, totally inoperable case of sarcoma of the parotid and neck. Diagnosis of spindle-celled sarcoma confirmed by microscopical examination. Entire disappearance of both tumors under three months' treatment. Patient shown before the New York Surgical Society last evening, March 24, 1894. In perfect health, without trace of disease, five months after cessation of treatment.

"I wish to merely refer to your case of probable sarcoma of the iliac fossa, the Simon boy, in which the clinical diagnosis was not confirmed by microscopical examination. The growth apparently disappeared; but about six months later a soft, fluctuating area appeared over the posterior part of the ilium, and necrosed tissue without any trace of bare bone was found on opening. Examination of the material removed was negative. He has since developed one or two areas of fluctuation further down, which seem to be either an extension of the process or are possibly due to tubercular disease. I have been unable to find any bare bone, however, and still think the diagnosis of sarcoma the more likely.[1]

"In all the cases above enumerated, with two exceptions—the Simon boy and the sacrum case (Case X.)—the diagnosis was confirmed by careful microscopical examinations, and in most cases the diagnosis was made by more than one pathologist."

My own experience with the treatment by the mixed toxins is limited to the following case, although I have referred cases to Dr. Coley for treatment.

On December 12, 1895, I presented before the Brooklyn Surgical Society a patient upon whom I operated at St. Mary's Hospital, by external pharyngectomy, for the removal of a melanosarcoma of the left tonsil and fauces. A recurrence took place in four weeks and after the external wound had closed. A portion of the new growth was removed and the diagnosis confirmed by the microscope. Further operative interference was not deemed advisable, and he was placed under treatment by injections of Coley's fluid, prepared by Dr. Wilson at the Hoagland laboratory. Very decided reaction followed each injection, which was made deeply in the left arm; massage was employed after each injection, so as to disseminate the injected material rapidly. A sharp chill followed each injection, and a rise of temperature to 103° F.

[1] Since writing the above a further examination in this case confirms the original diagnosis of sarcoma.

took place. There was about one day's illness following each injection. He visited the hospital each third day, received his injection, returned home and went to bed, and upon the following day, or that intervening before the time for the next injection, he pursued his occupation as a salesman. At the end of three weeks the new growth in the lateral pharyngeal wall had disappeared, and the frequency of the injections was lessened. They were given at first every four days, and finally once a week, as a prophylactic measure, for four months. At the time of exhibiting the patient, three months after discontinuing the treatment, no trace of the disease could be found.[1]

Two years afterward this patient reported himself with a recurrence of the growth. He was advised to have the toxin treatment recommenced at once, and promised to report to the hospital for that purpose. He failed to do so, however, and disappeared from my notice.

Since writing the above I have learned that this patient perished about a month ago with extensive sarcomatous infiltration of the structures of the neck on the side corresponding to the original disease of the tonsil.

C. Mansell Moullin[2] has employed the Coley fluid in ten cases. Two deaths followed the use of the mixed toxins. One of these, that of a very feeble old man of over seventy years, with an enormous and very vascular sarcoma of the femur, has been already referred to. The first injection was not followed by any conspicuous result; but the second, given two days later, led to a rigor which was followed by rapid and fatal prostration. The second case died of pyæmia, reference to which will be made later on.

Of the remaining eight cases one was a carcinoma of the breast and axilla, which showed no change. A second was a lymphosarcoma of the groin in a young man, who declined further treatment after one or two injections. A third was a similar growth in the neck of a man sixty-five years old, which was not affected, although the toxins were injected in considerable doses. Two other cases improved slightly, and in three cases the tumors disappeared.

In one of the cases the original tumor disappeared by sloughing after injections directly into the tumor. The woman was pregnant at the time. A recurrence in another locality subsequently took place.

In one of the cases in which the tumor disappeared and in which the treatment was begun in November, 1895, the patient was seen in March, 1896, when it was stated that there was very little of the tumor to be felt. In November, 1897, two years from the commencement of the treatment, no tumor was present, and the patient was in good health.

In another of the successful cases the treatment was commenced in November, 1896, and the patient was shown at the London Medical Society in November, 1897, one year later. The tumor, which had existed in the left loin, had disappeared.

[1] Brooklyn Medical Journal, May, 1896, p. 319.

[2] Op. cit.

In the third successful case the patient had a tumor of the hip of four months' duration. The swelling of the hip diminished slowly at first, and subsequently more rapidly. An abscess subsequently formed and opened spontaneously. A year later there was no recurrence.

It is to be regretted that in Moullin's three cases in which the tumors disappeared there was no microscopic examination made, and hence the proper proof that they were indubitably sarcoma is wanting. They were diagnosticated as such by others, as well as himself, and Moullin declares that if they were not sarcomas it is impossible to say what they could have been.

Dr. W. B. Johnson,[1] of Paterson, N. J., reports a case of very large spindle-celled sarcoma of the pharynx which disappeared entirely under the mixed toxin treatment, and was well when last seen, three years later. This case was seen in consultation by Dr. Coley, and the treatment was directed by the latter.

Dr. R. M. Stone,[2] of Omaha, reports an inoperable sarcoma of the uterus which disappeared under treatment, the patient being now well, two years later.

The principal interest in the question notably involves the application of the treatment to sarcoma, since it is now generally admitted that in a large majority of cases carcinoma will not yield in a sufficient number to warrant its employment save as a forlorn hope.

Dr. Coley has kindly placed at my disposal his statistics, which may be briefly summarized as follows:

Total number treated, 125. Of these 76 were round-celled, 17 spindle-celled, 5 mixed-celled, 8 melanotic round-celled, 2 chondrosarcoma, 11 sarcoma in which the type of cell was not given, and 6 were cases of inoperable sarcoma in which a purely clinical diagnosis was made.

An analysis of the effects of the treatment upon the different types reveals the following:

Round-celled sarcoma, 76 cases. Of these in only two did the tumors disappear under treatment. Of the remaining 74, 38 were not appreciably affected by the treatment; in 36 more or less improvement was noted.

Spindle celled sarcoma, 16 cases. Of these 9 disappeared entirely; in the remaining 7 marked improvement was manifested. In not a single case of this type of the disease was there failure to bring about marked changes in the growth.

Mixed-celled sarcoma, 5 cases. In one case in this group the growth disappeared entirely, remained away for three and one-quarter years, and then recurred; 3 of the cases were improved, and 1 was unimproved.

[1] New York Medical Record, November, 1894, p. 616.
[2] Loc. cit., November 20, 1896, p. 746.

Melanotic sarcoma, 8 cases. Two cases of this group showed slight improvement, while the remaining 6 were unaffected by the treatment.

Chondrosarcoma, 2 cases. One of these, a very large growth, disappeared and recurred at the end of seven months. The other was slightly improved.

Sarcoma (type of cell unknown). Of these 1 case disappeared entirely; 5 were improved, and 5 were unimproved.

In addition to those cases in which a microscopical diagnosis was made the 6 cases of inoperable sarcoma in which a clinical diagnosis was made should be taken into account. Of these 2 were cases of osteosarcoma, in one of which the tumor disappeared; in the other improvement was noted. In the remaining 4 cases the growths sprang from the soft parts; 2 of these were improved, and in 2 cases no improvement was apparent.

In the grand summary it may be stated that in 16 cases the tumors disappeared entirely, and that in but one of these was the crucial test of a microscopical diagnosis wanting.

Of the 16 cases, 14 have been traced, with the following result:

Spindle celled Sarcoma. Nine of the fourteen cases were of this type. A study of the after-history of these reveals the following: One case remains well after eight years. This case was treated with living cultures of the streptococcus erysipelatis. One case remains well at the end of four years. One case is well after three and one-half years. One case is still free from the disease after two years and ten months. One case remains well after one and one-quarter years. One case relapsed in eight months and again disappeared under treatment. One case recurred in six months and again disappeared under treatment. One case is well at the end of five months.

Mixed-celled Sarcoma. In the only case of this type in which the tumor disappeared the patient remained well for three and one-half years. She then suffered a recurrence in the abdomen, of which she died in April, 1897.

Chondrosarcoma. But one case of this type occurred in the 16 cases included among those in which the tumor disappeared. Recurrence took place in seven months.

Osteosarcoma, 1 case. This is the only case of sarcoma in the list in which a microscopical diagnosis was not made. Clinically it was a case of inoperable sarcoma of the sacrum. The patient continues well after two years.

Round-celled sarcoma, 2 cases. One case remains well two and one-half years after the disappearance of the tumor. The remaining case was well when last heard from, three months after the treatment.

It will be noted that not all of the cases of carcinoma in which the treatment by the mixed toxins has been tried have proved absolute

failures in Dr. Coley's hands. In my own case, that of an inoperable epithelioma of the chin and floor of the mouth, referred by myself to Dr. Coley for treatment, the patient remains well three years since the beginning of the treatment. In a second case, that of an epithelioma of the face, the disease disappeared, but recurred within a year. A third case was one of recurrent carcinoma of the breast, which with constant treatment for two and one-half years, remained free from evidences of the disease.

Since the preparation of the above Dr. Coley informs me that he has treated fifteen additional cases of sarcoma with the mixed toxins, with one entire success, and one case in which the tumor almost entirely disappeared. This makes a total of 140 cases of sarcoma, in 17 of which there was a complete disappearance of the growth. Of the cases which have not relapsed 1 has exceeded the four-year limit; 1 has exceeded the three-year limit, and 2 have exceeded the two-year limit. In addition to this 1 has passed the year limit, with no sign of recurrence, and is still under observation, with no recurrence, and 2 are respectively two and five months each free from recurrence after cessation of the treatment.

Of those that recurred, the longest time that the patient was free from the disease was three and one-quarter years, when a recurrence in the abdomen resulted fatally. The shortest time that the patient remained well after complete disappearance was six months. In one case of recurrence the tumors disappeared a second time under the toxins.

In one of Coley's cases, that of a round-celled angiosarcoma of the mamma, the tumor was so greatly reduced in size that it became an operable case and was extirpated. The patient was lost sight of at the end of six months, at which time no recurrence had taken place. It should be stated in this connection that the case was treated with the erysipelas-prodigiosus *serum*.

Of twenty-six cases treated by other surgeons by Coley's fluid, collected and studied by him, the following is a brief summary:

Spindle-celled sarcoma, 6 cases. Of these 5 disappeared and 1 was improved.

Round-celled sarcoma, 9 cases. Of these 7 disappeared and 2 were improved.

Sarcoma; type not mentioned, but diagnosis confirmed by microscopical examination, 5 cases; 3 disappeared.

Sarcoma; clinical diagnosis alone. Two disappeared and 2 were improved.

Of the above cases one is known to be well more than three years, one more than two years, and one is still free from the disease at one and one-half years.

DANGERS OF THE TREATMENT. The dangers arising from the supervention of an accidental attack of erysipelas, the inoculation of a patient directly from a case of the disease, or with living cultures of the streptococcus erysipelatis, need not detain us at this time. The risks attending these methods are essentially those incident to erysipelas itself occurring in a patient the subject of a malignant disease, and whose vital powers are already taxed to the utmost in maintaining an unequal combat against local extension and general invasion. Since these procedures have been practically abandoned for the less uncertain methods involving the use of toxins in either pure cultures of the erysipelas germ or mixed cultures of this with the bacillus prodigiosus, our attention may be most profitably turned to the latter.

First, it should be borne in mind that the reaction depends upon the dosage of the toxins. Unlike most other therapeutic agents animal toxins vary very greatly in their effects upon different individuals, so much so that it becomes necessary to establish the dose in each case by commencing with the minimum amount that experience has shown will produce an effect in those the most susceptible. In this manner safety within certain limits is assured, although a greater expenditure of time is necessary in bringing the patient under the full influence of these agents.

In the employment of the mixed toxins, according to Coley's experience, it is better to commence with a dose as small as one-quarter of a minim, increasing this at each administration until the effects of the toxins are assured. Profound depression is not desirable, nor need this occur, save under the exceptional circumstances of a patient so near to death that no treatment whatever should be employed. To give an initial dose under these circumstances that would produce any reaction whatever would be to invite collapse. This was evidently the condition present in one of Moullin's fatal cases previously mentioned, a very feeble man of seventy years, with an enormous and very vascular sarcoma of the thigh.

This latter condition may likewise be brought about in those not too far gone in an over-anxiety to hurry the treatment by using too large a dose to commence with. In all the reported cases of alarming collapse following very severe reaction a larger dose than that mentioned was employed. This includes Répin's case, as well as that of Johnson. It would be just as rational to discard the use of any therapeutic remedy for the sole reason that in some instances it had been employed in unnecessarily large or too frequent doses.

There is one possible danger pointed out by Moullin,[1] suggested by an experience in the use of toxins in a case of breaking-down sarcoma with necrosis of bone and suppuration, in which death resulted from

[1] Op. cit.

pyæmia. The syringe was carefully sterilized and the injected fluid was likewise shown to be sterile. In addition to this the fluid from the same bottle was used upon the same day in another patient. The explanation offered by Moullin seems rational. It is that the use of the bacillus prodigiosus in a case in which suppuration was present either destroyed the immunity which the patient had acquired to the pyogenic organisms, or increased the virulency of the latter, or both, properties the possession of which led Coley to add it to the streptococcus toxin in order to enhance the effect of the latter.

A similar experience occurred to Mr. Marmaduke Shield.[1] In the last-mentioned case the patient had been operated upon for a rapidly growing myeloid sarcoma of the left breast. A recurrence in the axilla and beneath the clavicle, as well as in the scar of the original wound, had taken place. One of two growths in the scar was on the point of breaking down. The patient's general health and nutrition were good. Eight injections, with gradual increase in the dose, were given, but a week was allowed to elapse between the first five and the remaining three. The autopsy showed infarcts and abscesses in the liver, myocardium, kidneys, and right knee-joint, together with a purulent infiltration of the muscles of the thoracic wall beneath the site of the two nodules in the scar, which had disappeared under the treatment. A bacteriological examination showed the presence of the staphylococcus aureus in the secondary abscesses. In this, as in Moullin's case, proper aseptic precautions were taken in making the injections; the fluid employed was found to be sterile, and injections had been made upon another patient from the same bottle with little or no reaction.

These experiences would seem to indicate the necessity for a careful selection of cases with the view of eliminating those in which suppurative processes are in progress.

The Question of Habituation. In this connection the researches of Marmoreck should be borne in mind. These consisted in the employment of injections of increasing doses of streptococcus toxin into animals with a view of finally rendering the latter immune, to the end that a serum might be obtained from the immunized animal to be employed in the treatment of streptococcus infection.

There can be no question that the general effects of the toxins become rapidly less pronounced in the course of the treatment, as immunization becomes established. While early in the treatment a comparatively small dose of the toxin is sufficient to produce a decided rise of temperature, this in some instances has been increased, after a few injections, to double, and upon occasion to quadruple, the original dose in order to obtain the same effect.

[1] British Medical Journal, January, 1897.

Inasmuch as the local action upon the tumors follows a course parallel with the intensity of the general reaction, it necessarily follows that as immunization is established the effect upon the growth becomes less and less marked, until at last this becomes *nil*, and the neoplasm, released from the restraint exercised upon it by the toxins, resumes its former progressive march. Thus it is not infrequently observed that a tumor which shows marked modifications in connection with an intense and high grade of general reaction may, as immunization becomes established and the former ceases to be manifested, fail to show signs of amelioration, in a short time giving decided evidences of increasing growth. It is the unfortunate existence of a previous immunization, either natural or acquired, in individual cases that leads to lack of uniformity in effects in the commencement of the treatment. Upon the same theory is likewise to be explained the fact that some cases that give promise of a happy issue in the commencement of the treatment come to a standstill, and finally become the subjects of a recrudescence. It is this immunization which limits the efficacy of the treatment of malignant tumors by the streptococcus erysipelatis. On the other hand, there are subjects who either do not become immune at all or do so with great difficulty. In this manner are to be explained the lasting cures that have been recorded as resulting from a prolonged course of treatment.

The Condition of the Tumors Under the Influence of the Erysipelas. Observations bearing upon this point are yet insufficient in number to form a basis upon which to build up a rational theory as to the modus operandi of the process of absorption or other means through which the disappearance of the tumors is brought about. In the only fatal case of sarcoma, that of Busch, in which a post-mortem examination following death from accidental erysipelas, in the course of which the tumor was disappearing, was made, the streptococcus was present, as was to have been expected. All that remained of the structure of the tumor at its central portion, where the changes were most marked, was represented by connective tissue, which contained in its interstices a large amount of yellowish fluid. The characteristic sarcoma cells were absent, having probably undergone fatty degeneration, and their place was supplied by this yellowish-white, opaque fluid, which contained a number of fat granules. In the outlying parts of the growth, areas still unaffected by the changes going on in the central portion could be distinguished, and served well for purposes of comparison, as well as to identify the nature of the growth.

Of the cases of carcinoma examined after death from erysipelas one is that of Neelsen.[1] Here the anatomical modifications brought about

[1] Centralblatt für Chirurg., 1884, No. 44.

by an attack of erysipelas in a carcinoma of the mamma were the subject of histological investigation. The patient died from the excessive febrile movement. At the post-mortem it was found that the tumor was partially destroyed. In certain places the epithelial alveoli had undergone fatty degeneration. In other places necrosis had taken place, leaving only débris. The walls of the empty alveoli were crowded together in spots by a new and abundant proliferation of young epithelial cells. The latter extended also into the regions adjacent to the tumor, and especially into the skin. It is to be regretted that in this connection Neelsen did not make a bacteriological investigation.

Janike's case was also one of carcinoma. Here particular attention was paid by Neisser, who made the examination, to the invasion of the streptococci. The micro-organisms were found between the cell-nests, and surrounding the latter, although actual penetration of the cells themselves was not demonstrated. With the exception that the latter were paler and less distinct, suggestive of a commencing coagulation necrosis, the carcinomatous cells showed but little change. Certainly no evidences of inflammatory change were observed.

On the other hand, in Shields' fatal case,[1] the statement is made that the well-marked effect upon two of the tumors, and which led to their disappearance, seemed to be due to a purely inflammatory action in a soft neoplasm. It should be noted, however, in this connection that a suppurative process was present, and that the post-mortem likewise revealed a purulent infiltration of the thoracic wall beneath the site of the two nodules which had disappeared.

Spronck, in the course of his experiments upon dogs, found fatty degeneration to be present in tumors removed from animals while under treatment with erysipelas toxins.

So far as our present knowledge of the processes by means of which malignant tumors disappear under the influence of erysipelas extends, these include (1) sloughing *en masse;* (2) a rapidly destructive degenerative process, comparable, as observed by Moullin, to acute yellow atrophy of the liver, and which, for want of a better name, may be called fatty degeneration. These processes are known to have occurred in malignant growths of connective-tissue origin, or, in other words, the sarcomata. It has been suggested that these two processes depend, the first upon the presence of pyogenic organisms, such as are present in growths already breaking down, or under circumstances where these can give access to the growth, as through an accidental abrasion; and the second upon the absence of these micro-organisms. The first is of the nature of a septic while the second is an aseptic process. In the presence of the former the inflammatory changes with sloughing of the growth in whole or in

[1] Op. cit.

part constitute the prominent features, while in the latter, although there may be some redness about the tumor at first, and some increase in size as well, softening occurs, the color fades out, and the surfaces flatten; in some instances a hollow may be left at the former site of the tumor.

On the other hand, the changes observed in carcinoma differ somewhat from the foregoing in degree, although the same process of fatty degeneration seemed to be present in Neelsen's case, according to his description of the histological findings. In addition, however, there appeared a new cell-growth, the exact relation of which to the destructive process does not seem apparent. In Neisser's examination of Janike's case the former came to the conclusion that a partial destruction of the cell nests of carcinomatous tissue resulted from the invasion of the streptococci, this being not necessarily accompanied by an inflammatory process. It is possible that the conditions observed by Neelsen and those found by Neisser were but different stages of the same process, and that the incompleteness of the latter, as well as the presence of the new formation tissue in the former, explains the differences in the behavior of the two varieties of malignant growth under discussion, in the presence of erysipelas or its toxins, the one furnishing the most frequent successes, the other the most frequent failures of the treatment.

The Rationale of the Action of the Streptococcus Erysipelatis and its Toxin. The consideration of the rationale of the action of the streptococcus erysipelatis and its toxin upon the life-history of malignant tumors constitutes the most important as well as the most obscure portion of the subject. Among the older observers who noted the curative action of accidental erysipelas, the prevalent theory, unsatisfactory as it appears to us at the present day, was that the superadded disease exercised a special or superactive function which accompanied the convalescence of acute febrile diseases. This, however, in no measure explains the elective action of this disease for malignant neoplasms, nor why curative influences exerted over the latter were reserved almost exclusively for erysipelas.

In the first contributions upon the subject, and before the fact that the toxins exercised a decided influence upon the growths without the presence of the germs, it was believed that the coccus excited a direct destructive action upon the cells of the neoplasm. In the light of later development this theory is no longer tenable, even though it might have been worthy of consideration in the past. Certainly it was not sufficient to account for all the phenomena in the different cases.

Another theory of the rationale of the cure relates to the occurrence of the high temperature resulting from the treatment, and the influence which this exerts over the vitality of the cells. Bruns was inclined to this view; but it is difficult to understand why conditions unfavorable to cell-life created by the fever of erysipelas should differ in any respect

from those arising from fever the result of other diseases. A number of conditions involving the febrile state are now known to depend upon specific organisms, to say nothing of septo-pyæmic conditions occurring in the history of the tumors themselves involving high temperature; it is yet to be shown that these have any influence upon the growth of tumors. As a matter of fact, it is the common experience that general infection, including fever, and excessive malignancy of the breaking-down growths, go hand in hand.

The supposed parasitic origin of cancer has given rise to the theory that the modifying influence of the erysipelas germ is a result of a direct antagonistic effect upon the micro-organisms of the neoplasms.[1]

The exact manner in which this antagonistic bacterial action is exercised is not, however, made clear, although, according to its author, if we accept the micro-parasitic origin of malignant tumors, an explanation of the action is not difficult, and example and analogy are drawn from the well-known fact that "a small quantity of blood-serum of an animal rendered immune to tetanus is capable of destroying or rendering inert the virulent bacilli in a fresh case." In the present state of knowledge regarding susceptibility and immunity, this analogy cannot hold good, for the reason that in the one case the effects depend upon the introduction of an immunizing principle, secured through the influence of a toxic agent, or, in other words, an antitoxin, while in the other the toxic principle itself is introduced, and with the end only too frequently of producing an undesirable immunization instead of a persistence of the toxic effects, upon which the amelioration apparently depends. If immunization plays any rôle whatever, it must almost of necessity either result from the effects of the streptococcus or its toxins in securing immunity against its own products or those of the parasites of the growth, or both. That the former is true is shown by Marmorek's work; that the latter is possible cannot be denied. Neither, however, can satisfactorily explain the local effects upon the tumors, even though they could be brought to suggest a reason for an inhibition of growth on the part of the latter or the prevention of a recurrence after removal.

While the ground taken by Coley cannot be considered as absolutely untenable, the fact that parasitic origin of cancer is considered as being largely hypothetical at this time, on the one hand, and, on the other, the absence of uniformity of results, such as have been obtained experimentally in tetanus and clinically in diphtheria, must of themselves militate largely against it, even though theoretical considerations be left out of the question. To this is to be added the fact that in the class of cases under consideration, the toxins, so far as their immunizing effect

[1] Coley: Annals of Surgery, vol. xiv. p. 217. THE AMERICAN JOURNAL OF THE MEDICAL SCIENCES, May, 1893, p. 500; July, 1894, p. 62; September, 1886, p. 279.

is concerned, always act slowly, and with the necessity of increasingly large doses in order to produce a repetition of a primary intense effect. On the contrary, their toxic effect, both general and local, is immediate and *pari passu* with the constitutional disturbances; the tumor softens and shows other evidences of necrobiosis in from twenty-four to forty-eight hours. Further, the primary maximum effect is reached at once, is short in its duration, and is frequently difficult of reproduction after it has subsided. Finally, with the immunization to the streptococcus itself comes a cessation of immunization to the micro-organism of cancer, if such exists, since a renewal of the growth of the latter, if it has not disappeared, as a rule, follows very quickly. This peculiar circumstance of a cessation of one property of immunization coincidently with the development of another has probably no analogue in bacteriological experience, although a number of examples of both micro-organisms and toxins are known, which produce immunization against themselves as well as against other micro-organisms and toxins.

According to the view of Répin, an elective intoxication of the cells of the neoplastic tissue occurs. It must be confessed that the processes of fatty degeneration, necrosis, and finally the resorption and elimination of the necrotic elements, lesions histologically observed, more closely approximate to results that may be supposed to follow a direct toxic effect upon the cells, than to the hypothesis of the action of one parasite upon another. The clinical evidence likewise favors this view. In all cases of cure or amelioration the effects of the erysipelas or its products have assumed a hypertoxic form: the more pronounced the so-called reaction the greater the hope of success of the treatment. Failure to effect reaction signifies that no effect upon the tumor is to be expected, and inability to reproduce successively the symptoms of intoxication is followed by recrudescence, in which all the previous characteristics of the growth are restored.

Répin emphasizes the view of cell intoxication by calling attention to the analogous action of tuberculin, the use of which is followed by a limitation of the characteristic action on tuberculous tissues as far as producing necrosis and the elimination of this tissue is concerned.

The elective action of certain medicinal agents and the mild or excessive toxicity of these in proportion to the dosage and toleration established to certain tissues, constitute an example of elective cell intoxication. This affinity of tuberculin for tuberculous tissue is explained by the fact that the cells of the latter acquire a susceptibility for the products of the tubercle bacillus from having been in permanent contact with the latter. The fact is also to be recalled that when a person is bitten a second time by a venomous serpent, even after several years following the first infection, the scar of the former wound presents evidences of irritation, as if the cells which were affected by the venom

retained for a long time a special susceptibility in this respect. A similar experience attended the treatment of a case of sarcoma of the tonsil by the venom of the cobra capello (Répin). The effects of the streptococcus in producing emaciation, with destruction of the red blood-corpuscles and increase of the leucocytes, are also duplicated in the case of some of those agents when pushed to the extent of producing a local action, as, for instance, in the case of arsenic when this remedy is administered to the extent of obtaining amelioration in cases of lympho-sarcoma and lymphadenoma. Further, with interruption of the treatment the symptoms of chronic poisoning subside, the general health is restored, while at the same time the tumors take up their original growth.

Further, it should be borne in mind that the locus minoris resistentiæ incident to all local diseased conditions must play a part in the alterations manifested by the effects of all remedies. In order to establish an elective action the previous presence in diseased structures of parasitic organisms or their impregnation by specific poisons is not necessary. The fact that large tumors and those that existed for a longer time, and even those in process of breaking down, yield more readily than those smaller in size and of more recent growth, suggests that the cells of the former, from their great age, possess a lower vital resistance, and hence break down more readily under the influence of the intoxication than those of more recent origin. The youngest cells of the neoplasm in all probability escape the influence of the poison during the susceptible period and prior to failure to obtain reaction. The tumor is thus only partially destroyed and increases rapidly in size. This constitutes the weak point in the method.

Finally, it must be acknowledged that these reflections upon the influences exercised by the establishing of a locus minoris resistentiæ hold good to a greater or lesser extent, and in a variable manner, in their relation to direct destructive action upon the cells of the new growth by the streptococcus erysipelatis, the effects of high temperature, antagonistic bacterial action, as well as elective toxic influences.

Treatment with the Toxic Blood-serum of Animals Infected with Streptococcus Erysipelatis. In this method of toxitherapy the toxin is produced from the blood of an infected animal instead of from a bouillon culture. Répin claims to have employed toxins derived from the blood of rabbits killed by inoculation by the streptococcus. The first published account of this method is by Emmerich.[1] His method consists in inoculating a sheep with a virulent streptococcus and bleeding it just before its death. The serum obtained is first filtered and then injected into the tumors. The injection is followed by a pseudo-erysipelas at the point of inoculation with elevation of temperature.

[1] Deutsche medicinische Woch., April 25, 1895.

Six cases, in which an appreciable effect upon the tumor was obtained, were treated by Emmerich, as follows:

CASE I.—Recurrent carcinoma of the breast in a patient fifty-four years old: recurrence at site of scar and in the axilla; induration of pectoral muscle and subclavicular fossa. Right arm œdematous and useless. Injections of 0.5 c.c. of the serum in the course of two days; tumor diminished in size fully one-half. Dose increased so that at the end of the third day the patient had received 2 c.c., when the tumor, as well as the infiltration of the pectoral, disappeared entirely. In the mean while the axillary involvement suppurated and was incised. The treatment was continued in diminished doses for twenty-five days in all, when all traces of the recurrence had disappeared. At the end of this time there occurred a pathological fracture of the clavicle, which, however, united. At the end of nine weeks the patient was dismissed in good health, and with the function of the arm restored.

CASE II.—Recurrent carcinoma of the breast; tumor size of hen's egg at the cicatrix, and three small scattered cutaneous nodules: daily injections of from 3 to 5 c.c. were made for a week into the principal tumor, without any effect upon the tumor injected, but the outlying nodules disappeared under the treatment.

CASE III.—Recurrent carcinoma of the breast, with metastasis in the liver and pleura: after ten days of treatment and the injection of 30 c.c. of the serum, one small nodule, the size of a cherry, had disappeared, and no further effect was obtained. The treatment was abandoned.

CASE IV.—Relapsing carcinoma of breast with cutaneous nodule in axilla: after fourteen days' treatment and the injection of 20 c.c. of serum, the cutaneous nodule was resorbed. Patient still under treatment.

CASE V.—Large carcinoma of breast with extensive axillary glandular involvement: 60 c.c. injected into the tumor and into the glands in the course of sixteen days; the glands diminished in size fully one-half; the effect upon the tumor was not so marked, this diminishing in size but slightly. The use of the serum was discontinued.

CASE VI.—Ulcerating cancroid of the external palpebral commissure in a woman of sixty-five years: local injections of the serum; growth disappeared and cicatrizing ulceration took its place.

THE USE OF THE VENOM OF THE COBRA CAPELLO. It has long been known that the venom of the cobra capello produces remarkable modifications in the nutrition of the parts bitten, such, for instance, as the atrophy of a member. Cures of leprosy and elephantiasis are also alleged to have followed inoculation with this poison; in some instances the victims of these diseases having purposely exposed themselves to being bitten in the hope of cure. The attempt to derive therapeutic action from this source is said to be devoid of danger if proper precautions are taken. These latter consist of the employment of a minute dose at the commencement, habituation becoming established by the steady increase in the size of the dose. Calmette was the first to succeed in the methodical immunization of animals, and the production of an antivenomous serum.

The dry venom of the cobra capello was employed by Répin in doses of one-fortieth of a milligramme, injected beneath the skin in the pectoral region in a case of sarcoma of the tonsil. The size of the dose was gradually increased so that in the course of a fortnight a dose of 7 milligrammes was reached. No febrile reaction occurred. The weight of the patient increased 2 kilogrammes during that period. These injections produced painful sensations in the tumor similar to those following the streptococcus toxin. No objective alterations in the growth were noted. When the dose was increased rather abruptly it was observed that the seat of preceding injections, which had long ceased to be painful, even upon pressure, again became as painful as they were upon the day when the injection was made.

The Influence of Artificially Produced Suppuration upon Malignant Growths. The subject of the induction of nutritive changes by artificially produced suppuration in malignant disease, with the view of influencing these favorably, has received some attention at the hands of experimental observers. Krynski, of Krakau,[1] endeavored to demonstrate the influence of artificially provoked aseptic suppuration upon the course of malignant neoplasms. He was induced to make these experiments by the occurrence of a case of malignant goitre, a portion only of which was removed to relieve pressure upon the trachea and impending suffocation. Owing to the necessity for reopening the wound, on account of subsequent hemorrhage, an abundant suppuration followed and continued for several weeks. During this time the greater portion of the remainder of the growth was cast off, healing finally taking place with a small nodule still existing and marking the site of the formerly existing extensive growth. The patient left the clinic, and with the latter exception was apparently well, but was known to have perished from the disease three months later. Upon the basis of this experience Krynski resolved to ascertain whether or not suppurative change of an aseptic character, with its comparative absence of danger, would, when artificially produced, favorably influence the growth of malignant disease. In two cases of advanced carcinoma of the breast in which trial was made of the injection of oil of turpentine, for the purpose of inducing aseptic suppuration, no result was obtained save the infliction of considerable suffering upon the patients. Although necrotic tissue was thrown off from the diseased area when suppuration was well established, the disease continued to make steady advance in the neighboring structures.

On the other hand, Wyeth[2] records an instance of a growth in the abdominal wall in a patient, thirty-three years old, which was apparently cured by a suppurative inflammatory process. A large portion of the tumor was removed by operation and pronounced by Prof. Welch,

[1] Centralblatt für Chirurgie, 1895, No. 30, pp. 697-99.
[2] Journal of the American Medical Association, June 30, 1894, p. 985.

now of Johns Hopkins University, as well as by Dr. William L. Wardwell, as sarcoma. It was found impossible to remove the entire growth, and the wound made was tamponed and the operation abandoned. Arsenous acid was subsequently injected into isolated areas in the remaining portion of the growth with the view of obtaining some specific action from this agent. Before all portions of the growth had been subjected to this treatment a violent suppurative inflammatory action occurred, and the treatment was abandoned. No hope was entertained of his recovery. The process of suppuration continued for several weeks, when it gradually ceased, the tumor finally disappearing. Ten years afterward he was known to be free from a recurrence of the disease. In commenting upon the case, Dr. Wyeth states that there was no erysipelas present, and that the case was positively one of sarcoma cured by the action of other septic or toxic agents of inflammation.

THE RÖNTGEN RAYS IN OPHTHALMIC SURGERY.

By William M. Sweet, M.D.,
PHILADELPHIA.

The value of the Röntgen rays as a means of determining the presence of pieces of metal in the eyeball has been conclusively shown by the experiments of a number of investigators, the earliest workers in this field being Dr. Clark, of Columbus, Dr. Williams, of Boston, and Dr. Max J. Stern, of this city. The knowledge that a foreign body is in the eye, however, is not all the information required by the surgeon who operates with the electro-magnet for its removal. Without some indication of the position of the body, it is not possible to reduce the percentage of failures of the magnet operation. The ordinary radiograph does not accurately indicate the position of the shadow of the foreign body on the plate in relation to the shadows of the bones of the head. Hence, it is desirable to state the exact spot at which to insert the magnet with the least injury to the structures of the eye.

The first attempt to determine the approximate location of foreign bodies in the eye by means of metal indicators placed without the ball was made by Dr. H. Lewkowitch, and reported in the London *Lancet* for August 15, 1896. In these experiments, which were made upon sheeps' eyes and the doctor's own eyes, the indicator consisted of a piece of wire placed in front of the eye, one of the arms of the apparatus pointing to the centre of the cornea. Only the anterior portion of the eyeball was included in the radiograph, the eye being rotated inward or outward to include a larger part of the globe. The determination of the position of the foreign body was then made by a triangulation of

two shadows on the plate cast by the foreign body, by moving the tube a known distance from the first position in making the second exposure. The photographic plate was placed at the inner canthus. In addition to these complications, and the liability of error in determining the angles of the tube in its two positions with the plate and the foreign body, the method is open to the objection that only a small portion of the eyeball is included in the radiograph.

In my early experiments with pigs' eyes placed in the ordinary Viennese mask, it was found that unless the rays were passed through some portion of the bony walls of the orbit, foreign bodies in the posterior portion of the vitreous chamber could not be shown.

In the first experiments which I made upon the human subject the photographic plate was inserted at the inner canthus. Photographic films were used, as being more readily cut to the shape desired. Each plate-holder carried two films, and two negatives were thereby secured at each exposure, thus avoiding errors arising from imperfections in the film coating.

The indicating apparatus consisted of an aluminum frame carrying three steel rods, each with a rounded end. The rounded extremities were adjusted to the inner and outer canthus and to the eyeball at the centre of the upper lid. Two exposures were made, one with the Crookes tube on a line with the inner and outer indicators, and the other below the horizontal plane of these indicators. In determining the position of the foreign body in the eye, the apparatus was attached to a fixed support, and a lighted candle employed to cast the shadows of the indicators on a cardboard similarly to those made on the negatives by the x-rays. A small object was then held in such a position that its shadow was identical to that of the foreign body. The candle was moved until the shadows of the indicators corresponded to those on the second negative. The crossing of the two lines of shadow of the test-object represented the situation of the foreign body.

This method of marking was first employed in the case of a young man with a piece of steel in the lens, sent to me by Dr. A. G. Thomson. From a number of negatives I located the body 7 mm. behind the centre of the cornea, and about a millimetre to the nasal side. Dr. William Thomson subsequently removed the soft and opaque lens with the piece of steel imbedded in it.

While the use of the photographic plate at the inner canthus has the advantage of bringing the sensitive film much closer to the eyeball than when in any other position, an important consideration when dealing with very small objects, it has the objection that the whole eyeball is not included on the plate. For this reason, and also because of the imperfect coating of the celluloid films, I have since used glass plates bandaged to the temple. Instead of three indicators, two only are now used.

The principle of employing two objects of known position to locate the situation of a third object from the shadows cast by these objects upon a flat surface is extremely simple. For all practical purposes we may regard the rays from a Crookes tube, at least thirteen inches away, as being parallel in passing through a body so small as the eye. Therefore, if the relative position of two objects is known, we can readily determine the situation of the third. In employing this principle in locating foreign bodies in the eye, three factors are of importance, namely:

That the two indicating objects shall be at a known distance apart, and shall be parallel to each other and to the plate, and also in a perpendicular line with the plate.

That one object shall point to the centre of the cornea and be at a known distance from the eyeball; and

That the visual axis shall be parallel to the indicators and to the plate.

With the above facts known, it is unnecessary to take a measurement of the angle of the tube with the plate, as this is readily determined from the negative. The two indicators being parallel to each other and to the plate, the distance the shadow of one of the balls is posterior to that of the other is the measure of the distance the source of the x-rays is carried to the front.

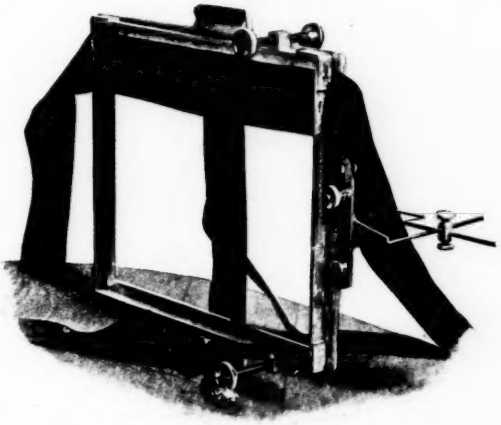
FIG. 1.

Indicating apparatus supported by head-band and plate held in place by bandage.

The indicators may be supported by a head-band and the plate held in place by an ordinary bandage, although more accurate results are obtained by employing a special form of apparatus, in which the indi-

cators are attached to the plate-holder, and are at all times parallel to each other and to the plate. The indicators are adjustable, so that one may be placed opposite the centre of the cornea while the other is toward the outer canthus.

FIG. 2.



Indicating apparatus and plate-holder combined.

In making the negatives the tube is in front, about thirteen inches from the plate and at an angle of from fifteen to forty degrees with a vertical plane passing through the apex of each cornea. The plate is to the opposite side of the head, and the rays pass through the eyeball and the external orbital wall before reaching the sensitive film. Two exposures are made, one with the tube in a horizontal plane with the two indicators, and the second at any distance below. The angle of the tube below the horizontal is unimportant as long as the two exposures give different relations of the indicators on the negatives.

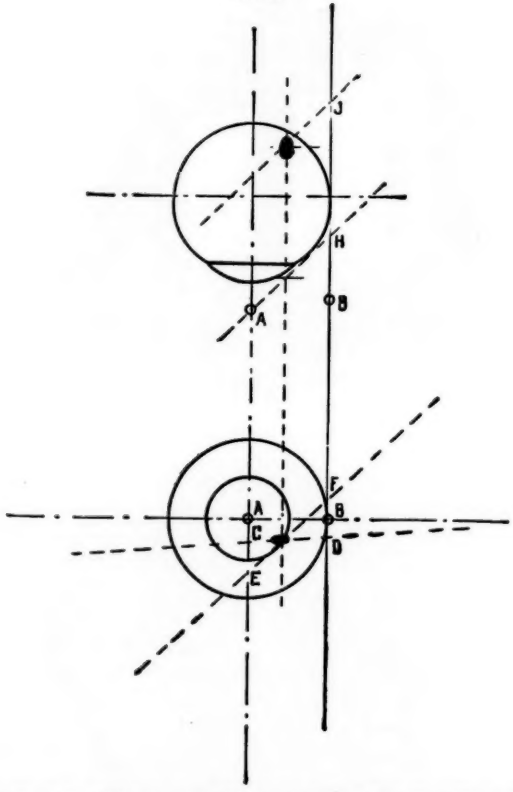
In determining the position of the foreign body in the eye, two circles 24 mm. in diameter (equivalent to the size of the globe) are drawn upon paper. One circle represents a horizontal section of the eyeball, and the other a vertical section. Upon the vertical section a spot is made at the centre of the circle, indicating the position of the central indicator of the apparatus. The distance between the two indicators is measured toward the temporal side, and a spot made to show the position of the external indicator.

On the circle representing a horizontal section of the eyeball a spot is made anterior to the centre of the cornea and at the same distance that the centre indicator was from the eye when the radiograph was made. Another spot to the temporal side, measured by the distance

between the two balls of the apparatus, marks the situation of the external indicator.

By taking the first negative with the tube horizontal to the two indicators, we measure the distance of the foreign body above or below the

FIG. 3.

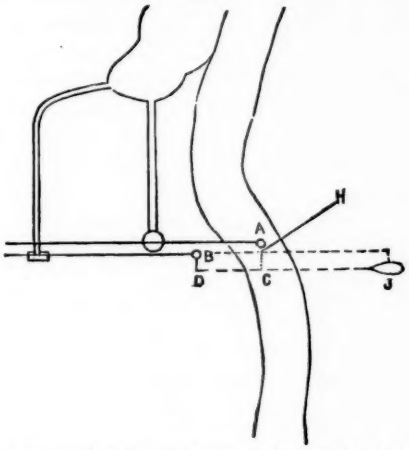


Diagrammatic circles of the eye, upon which measurements from the radiographs are made to show location of foreign body. Upper circle, horizontal section; lower circle, vertical section of eyeball. Patient of Dr. Wm. Thomson.

two balls of the apparatus. These measurements are indicated on the circle representing the vertical section of the eye, and a line is drawn through the points. At some point along this line is situated the foreign body. From the second negative, made with the tube below the plane of the two indicators, the measurement is taken of the distance the shadow of the foreign body is above or below the centre indicator, and

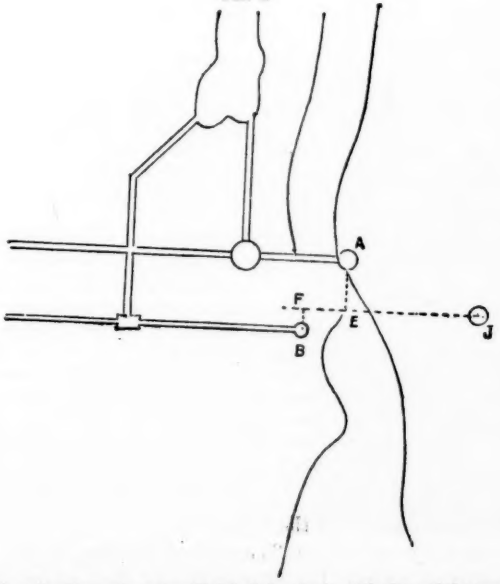
this point is indicated on the first circle. The same measurements are made for the external indicator. Where a line drawn through these

FIG. 4.



Outline drawing of radiograph made with tube nearly horizontal with plane of indicators.

FIG. 5.



Outline drawing of radiograph made with tube below horizontal plane of the two indicators.

two points crosses the line of measurements made from the first plate is the situation of the foreign body as respects its horizontal and vertical position in the eyeball.

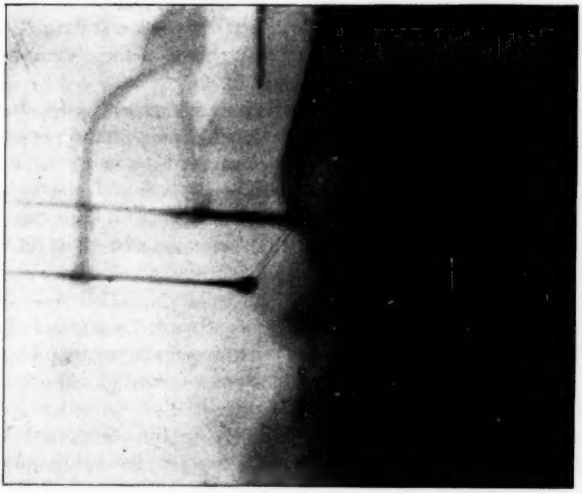
To determine the distance of the foreign body behind the apex of the cornea, one of the negatives is taken and a measurement made of the distance the shadow of the centre ball is posterior to that of the external ball. The distance is entered directly above the external ball on the diagram representing the horizontal section of the eye. From this point a line is drawn through the ball of the centre indicator, which indicates the direction of the rays from the tube when the exposure was made. Taking the plate again, we measure the distance that the shadow of the foreign body is back of that of the external indicator. This distance is marked perpendicularly to the spot representing the ball of the external indicator on the diagram, and a line is drawn parallel to the direction of the rays from the tube. Where this line cuts a line perpendicular to the position of the foreign body shown on the vertical section of the eyeball is the distance the foreign body is behind the anterior portion of the cornea. In cases where the foreign body is in the orbit and outside the eyeball, its location will be indicated by the crossing of the lines beyond the diagrammatic circles.

The first case upon which I employed this method was a young man, twenty years of age, a machinist by occupation. Six months prior to coming to Wills Eye Hospital a piece of steel struck him in the left eye. Dr. William Thomson referred the case to me to determine the presence of a foreign body and its probable location. Examination in April, 1897, showed a scar in the sclera 3 mm. from the corneal margin on the temporal side, starting from the horizontal plane and extending downward almost vertically about 4 mm. The ophthalmoscope failed to reveal the presence of a foreign body, but showed a cone-shaped mass of new tissue extending through the vitreous, with the apex at the disk. The visual field was lost centrally and to the nasal side, but partially preserved downward and outward.

A number of radiographs were made with the Crookes tube in various positions, and in each of the negatives the shadow cast by a foreign body was plainly visible. The two indicators in each exposure were 12 mm. apart, while the ball of the centre indicator was 4 mm. from the apex of the cornea. The external indicator was inadvertently placed 2 mm. nearer the eyeball than the centre indicator. This difference is allowed for on the diagrams. The exposures averaged four minutes each. Employing the method previously described, the measurements from the negatives indicated the position of the centre of the foreign body to be a point 20 mm. from the centre of the cornea, 5 mm. to the temporal side, and 3 mm. below the horizontal plane. The negatives also gave the probable size of the body to be 4 mm. long, 2.5 mm. wide, and 1 mm. thick.

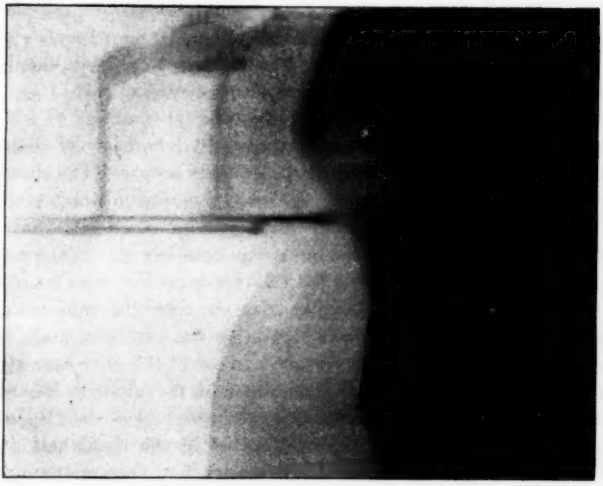
In reporting the case at the Washington meeting of the American Ophthalmological Society, Dr. Thomson stated that, owing to the mass

FIG. 6.



Radiograph made with tube below horizontal plane of indicators. Patient of Dr. Wm. Thomson.

FIG. 7.



Radiograph made with tube nearly horizontal with plane of indicators. Patient of Dr. Wm. Thomson.

of tissue surrounding the body, it was found to be impossible to remove it by the magnet, and that recourse was had to dissection. The body was extracted with some of the cicatricial mass surrounding it from a point in the sclera corresponding to that shown in the diagrams made from the radiographs, with preservation of the eyeball.

The rays were also employed on a patient sent to me by Dr. Jackson, who presented the history of a piece of metal flying into the eye twenty years ago. Examination by Dr. Jackson and by many other gentlemen, at the time the case was shown at a meeting of the Section on Ophthalmology of the College of Physicians, showed a dark mass lying to the temporal side of the disk, about ½ mm. long and ⅓ mm. in width, in an area of atrophied choroid and pigment deposit rather smaller than the disk.

Notwithstanding that over a dozen negatives were made of the case at different times with Crookes' tubes running under various degrees of vacuum and placed at various positions, no evidence of a foreign body was shown on a single negative.

The failure of the Röntgen rays to show on the photographic plate the presence of a foreign body in the eye when the ophthalmoscopic examination apparently indicated the existence of a body in the eye, led me to make a number of experiments on the cadaver to determine, if possible:

1. How small a metallic body in the eye could be determined by means of the Röntgen rays.
2. To what extent the bones of the orbit interfered with the passage of the rays.
3. The character of the tube and the vacuum at which it should be operated to give the best results.
4. The best point at which to place the tube.

Experiments were made in the pathological laboratory of Jefferson Medical College on a fresh, well-developed male subject. The shrunken eyeballs were removed, and fresh pigs' eyes employed in which pieces of iron had been inserted. In this way the nearest approach to the ordinary conditions met with in the live subject was secured.

In making the experiments on the cadaver exposures were made with two forms of the Queen focus-tube. In one tube the rays from the concave cathode focussed to a small point on the platinum plate, while in the second tube the focus was larger. In one of the pig's eyes a piece of fine wire was passed through the centre of the globe in its antero-posterior diameter. In another pig's eye three pieces of wire, about one and one-half inches long, were inserted in the nasal half of the pig's eyes, entering at the corneoscleral margin and passing through the ball to the retina. The wires were respectively $\frac{9}{10}$, $\frac{1}{2}$, and $\frac{3}{10}$ mm. in diameter. The largest piece was partially cut through at intervals of

1 mm. In a third pig's eye pieces of iron were inserted in the ball, each about 1 mm. long, and varying in thickness from $\frac{3}{10}$ to 1 mm. The bodies were inserted in the eye at the nasal side. A number of exposures were made with each tube, several at an angle of fifteen degrees, with a vertical plane passing through the two eyes, and a number at an angle of about forty degrees in front of this plane.

These experiments seemed to leave no doubt as to the great superiority of the small focus-point tube as compared with that of large focus. The shadow of even the finest wire is distinctly shown on the negatives made with the former, while in those made with the latter the shadow of the wire is blurred and indistinct. This is in harmony with the well-known fact that the distinctness of the shadow of an object some distance from a plane surface depends upon the size of the source of light, and where the point of illumination is large, as compared with the size of the object, the shadow cast may be indistinct or even imperceptible.

The negatives also show to what small degree the bones of the orbit obstruct the rays. The thickest portion of the external orbital wall is where the frontal and malar bones join, forming the external angle of the orbit. In the deeper portion of the orbital wall the bones are relatively thin. Notwithstanding the difference in the thickness of the bones, the shadows cast by the steel wires are perfectly distinct throughout their entire length. In making radiographs of the eye the best results are secured when the tube is run at high vacuum, so that there shall be great penetration of the ball and the muscular and bony structures. In this way the shadow of the denser metallic body is more clearly shown upon the plate.

In the experiment with the small bodies in the eye the superiority of the small-point focus-tube for eye-work was again shown. The exposure made with the large-point focus-tube failed to show any shadows on the plates of the bodies in the eye, while in the negatives made with the small-point focus-tube each of the five foreign bodies can be clearly seen. In dealing with the live subject the possible slight movement of the head during exposure is a factor of importance.

The position of the tube appears to make very little difference in the results. The negatives made with the tube at an angle of fifteen degrees with the vertical plane passing through the apex of each cornea give as clear shadows of the test objects as when the tube is situated further to the front.

In my experiments I have used several makes of Crookes' tubes, although the majority of the exposures were made with the Queen self-regulating tube. In this tube, by an ingenious arrangement of a shunt circuit, the current passes around the tube when the vacuum becomes too high, heating up an auxiliary bulb of potassium hydrate and bringing down the vacuum. The gap in the shunt circuit may be adjusted

to any desired vacuum, and the tube then runs automatically, irrespective of the length of exposure. The time of exposure was varied from two to six minutes, four minutes appearing to give perfectly satisfactory results, although in one instance an exposure of thirty-five seconds gave a negative of excellent detail.

Since the first employment of the above method of determining the precise location of foreign bodies in the eyeball or orbit, numerous opportunities have arisen of verifying the correctness of the findings by subsequent operation. The value of the x-rays in traumatism in the region of the eyeball is shown by the following case, reported by Dr. H. F. Hansell:[1]

H. L., while pounding sheet steel on January 22, 1898, was struck in the left eye by a piece of the metal. He noticed an escape of fluid from the eye and immediate blindness without much pain. Examination at that time showed a linear incision 3 mm. in extent to the nasal side of the vertical diameter of the cornea, and the anterior chamber filled about one-fifth of its capacity with blood. Under cold applications the blood in the anterior chamber cleared up, and a small ragged opening could be distinctly made out in the periphery of the iris opposite the corneal cut.

Several radiographs were made, the plates recording the shadows of *two metal bodies.* One was located in the posterior chamber immediately under and to the nasal side of the lower end of the vertical diameter of the lens, and the other just anterior to the external orbital angle and very close to it in the soft tissues of the upper lid. The body in the eyeball was successfully extracted by the magnet at the point indicated by the radiographs, with the preservation of the eyeball.

A unique feature of this case was the discovery by the x-rays of the presence of a second piece of metal in the vicinity of the eyeball. The finding was confirmed by passing the magnet point over the part of the lid indicated by the radiographs to contain the body, the skin being raised fully one-quarter inch, showing conclusively the presence of a metal body in the tissues beneath this spot. The patient could not account for the presence of the metal body so near the eye. It certainly did not enter the lid at the time of the injury that destroyed sight.

In the following case reported by Dr. Louis F. Love,[2] the foreign body was removed after one unsuccessful attempt from the location indicated by the radiographs:

N. C., while engaged in chipping a rivet-head, was struck in the left eye with a fragment of the metal. The upper lid was cut through, the conjunctivæ œdematous, the sclera and cornea incised, vitreous and iris in the wound, the aqueous turbid, and the ciliary region tender on pressure. The vision equalled faint light perception, and all fundus reflex was lost. A series of radiographs located the body in the upper portion

[1] Section on Ophthalmology, College of Physicians of Philadelphia, March 15, 1898.
[2] Ibid., April 19, 1898.

of the ball just back of the equator. An attempt was made to extract the body by inserting the tip of the Hirschberg magnet through the enlarged wound of entrance, but was unsuccessful, the battery power employed being insufficient to move the body from the inflammatory exudation that existed. A large amount of bloody serum poured from the globe during the operation, so that the ball almost collapsed. Several days afterward the globe regained its shape, and additional radiographs were taken, which showed that the position of the body was the same as when the first negatives were made. The body was then removed by the magnet through an opening made at the equator just under the indicated location. The patient experienced little pain, and the wound healed readily, leaving the globe in fairly good condition.

The value of early operation in cases of foreign bodies in the eyeball, before inflammatory exudate has formed about the metal, is illustrated in the following case, reported by Dr. G. E. de Schweinitz:[1]

A. G., in loosening a piece of work in a lathe by repeated blows of a hammer, was struck in the left eye by a fragment of steel. The metal penetrated near the centre of the cornea, passed through the lens, and rendered the media so opaque that ophthalmoscopic examination was impossible; indeed, the lens in the ten hours that elapsed from the time of injury had become cataractous. A series of radiographs made the day following the injury indicated a piece of metal about 3 mm. long and 1 mm. wide situated 2 mm. below the horizontal plane of the globe, nearly 2 mm. to the nasal side and 23 mm. back of the centre of the cornea. The next day an incision was made through the sclera just below the lower margin of the external rectus, and the broad, flat extension point of a Hirschberg magnet introduced a distance of 15 mm., so as to bring it as nearly as could be calculated over the position of the macula. On withdrawing the magnet point a piece of steel, of triangular shape, of the size indicated, and weighing one-seventh of a grain, was found adhering to it. Three weeks after the operation the eye was still much injected and the tension raised owing to the swelling of the lens. The light-perception, however, is good in all portions of the field, although the condition of the eye indicates later enucleation as probable.

No better example of the value of the Röntgen rays in ophthalmic surgery could be found than is furnished by this case. The media were clouded, and there was no other means of determining whether the metal was imbedded in the opaque lens, was lodged in the vitreous chamber, or had passed completely though the eyeball into the orbit. The radiographs not only indicated the portion of the eyeball in which the body was lodged, but rendered possible a determination of its exact location.

[1] Ibid.

HEMORRHAGIC INTERNAL PACHYMENINGITIS IN CHILDREN.

REPORT OF TWO CASES.

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Most writers upon nervous diseases who make any mention of the occurrence of chronic internal pachymeningitis in children regard it as a rare occurrence. Sachs,[1] in his recent text-book, does not describe the condition, and I have known the existence of the lesion in children to be questioned by experienced neurologists. On the other hand, Doehle,[2] of Kiel, found a new membrane attached to the inner surface of the dura in 48 out of 597 autopsies on children under ten years of age—that is, in more than 17 per cent. of his autopsies. Although these figures are surprisingly high, it seems probable that chronic internal pachymeningitis is hardly to be regarded as a rarity in hospitals for children, and that the lesion in its slighter grades may be readily overlooked. Certain it is that the lesion is sufficiently frequent to deserve more attention than it has received. It is with a view to increasing the interest in this condition, which is not without practical importance, that I desire to report the following cases of chronic internal pachymeningitis, each of which was characterized by the occurrence of hemorrhage.

Case I.—A female child, aged five and one-half months, was admitted to Dr. Kimball's service in the Babies' Hospital on May 15, 1897. The family history was entirely negative. The patient was the first child. It is said that the child was well until one month ago, when it began to vomit, and vomited frequently until a short time previous to admission. The bowels were constipated. Examination showed that the child was fat and well nourished. The head was about normal in size and shape. The fontanelle measured two by two inches, and was not bulging. The sutures were open, and there was a soft spot over one parietal bone. The eyes, ears, nose, and mouth were normal. There were no teeth. Coarse râles were heard throughout the chest. The child vomited on the third and fourth days after admission. On the fifth day she developed tremor in the hands, especially marked in the right hand. The fontanelle was at this time rather tense, and the veins of the scalp distended. From time to time nystagmus was present, lateral and vertical in character. The pupils were small and responded feebly to light at times.

Nine days after admission the child had a general convulsion, which began with twitching in the ocular muscles and extended to the hands and feet. During the seizure the left arm and leg were rigid, while the right arm and leg were the seat of clonic spasm. The mouth deviated to the left. The duration of the seizure was about ten minutes. Cyanosis

[1] Nervous Diseases of Children, 1895.

[2] Verh. d. X. Internat. Congress, 1890, Bd. v. (Forensic Section).

was a feature of the convulsion. Ten hours after the first convulsion a second occurred, lasting about three minutes and closely resembling the first. After these seizures it was noted that the fontanelle was slightly sunken, and that the head constantly deviated to the right. Previous to these paroxysms the child had been drowsy; it now became semi-comatose for a time, but later was wakeful. The child grew gradually weaker, owing partly to the persistence of a severe colitis, which was the cause of the admission to the hospital, and after a few days died without having developed any new symptoms of neurological interest. The pulse and respiration were featureless and such as one might expect in any young child whose temperature ranged irregularly from 100° to 105°. During the last few days there were present the usual signs of bronchitis.

Autopsy by Dr. Woolstein, thirty-three hours post mortem.

Anatomical Diagnosis. Hemorrhagic pachymeningitis; fibrino-purulent pleurisy; acute broncho-pneumonia; pulmonary emphysema and congestion; fatty liver; nephritis.

Body. Plump, no skin lesions. Thumbs adducted, fingers loosely flexed.

Brain. Adhesions between pia and dura along superior longitudinal fissure, also over entire base and over the island of Reil on both sides. Covering the pia at these points there is a membrane, two to three lines in thickness, containing many spirally coiled bloodvessels, all filled with blood.

Pia apparently not adherent to brain. Ventricles normal in size; they contain about one drachm of fluid, hemorrhagic in color.

Choroid plexuses intensely congested, fluid blood in all the sinuses. Pia over cerebellum, pons, and medulla slightly thickened.

Cervical cord shows same conditions; rest of cord not examined.

Cerebrum. Right occipital region; pia detached from cortex in many places, here and there pia stained brown by pigment from extravasated blood. There is perceptible in this region, though more marked in sections from the island of Reil, a splitting up of the membrane overlying the cortex into two or more layers; the inner layer (pia) shows infiltration with small round cells, the layers external to this contain many new bloodvessels, some of which having ruptured, extravasation of blood into the surrounding tissues has occurred. Beside numerous small bloodvessels, the outer membranous layers consist of small round cells, fibroblasts, and a few very fine connective-tissue fibres. Between the layers lies a fine loose meshwork of small round and spindle cells containing a considerable amount of granular material (degenerated red blood-cells and fibrin).

Island of Reil. Same conditions, but much more marked.

Cerebellum. As above; formation of new bloodvessels very distinctly shown.

Choroid Plexus. Granular degeneration of epithelium and marked congestion.

Spinal Cord. Only slight traces of hemorrhage; membrane covering cord shows fibrous thickening; in places there is a division into two layers.

Case II.—Female infant, colored, aged twenty-two months, illegitimate, first child; mother healthy. Nursed for seven months. Since nursing was stopped has had repeated attacks of bronchitis. The child never walked or stood alone.

Examination: The head is markedly rhachitic, square, and flat on top. The anterior fontanelle measures three by two inches. The ribs are beaded; there is a marked lateral depression of the chest, and the epiphyses are enlarged.

The child's first stay in the hospital, about two months in duration, was featureless except for the facts that there were gradual slight loss in weight, considerable prostration, and numerous râles over both sides of the chest. During a second stay in the hospital, lasting a month, the child gained weight and showed no signs of bronchitis.

In October, 1897, the patient was admitted for a third time to Dr. Holt's service. It is stated that she was well until three days before admission, when she had four convulsions, followed the next day by five similar seizures. The general condition was very bad. There were signs of general bronchitis. The hands and feet were in the position of persistent flexor contraction characteristic of tetany. The knee-muscles were slightly rigid. The knee-jerks were unobtainable, and the fontanelle was tense and bulging. The child was in the hospital for five days before death occurred. During this time it grew very drowsy, but this was attributed to the administration of bromides. Hot baths had no effect on the carpo-pedal spasm. There was slight but varying rigidity of the muscles of the back of the neck. Ocular symptoms were not observed. During the last days of life the rigidity of the hands grew less, although there was no alteration in the spasm of the feet and legs. The child died comatose. Bloody mucous diarrhœa was present during the last period in the hospital. Fever was present and daily reached 102.5° or 103.5°.

Autopsy by Dr. Woolstein.

Anatomical Diagnosis. Pachymeningitis hæmorrhagica interna; broncho-pneumonia (acute and chronic); croupous and ulcerative colitis.

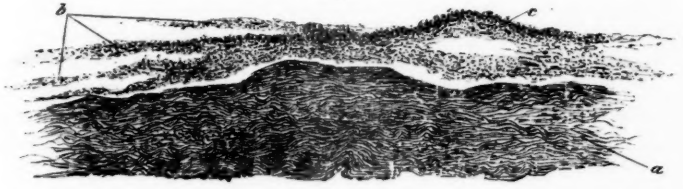
Brain. Weight, 1 pound, 5½ ounces (fontanelle 1½ x 1 inch; bulging). Over right half of convexity, a recent clot, in places one-quarter inch in thickness, covers the entire hemisphere, extending also on its outer surface and over the left occipital lobe. Upon being removed the inner surface of the dura is found lined by a thin, whitish translucent membrane, extending irregularly from the superior longitudinal fissure on either side. Dura thickened and yellow in color. The clot dips between the hemispheres and appears above optic commissure on the base.

Pia congested, and in places moderately œdematous. Ventricles and brain substance apparently normal. All sinuses filled with recent clots. The new membrane is especially distinct in both occipital fossæ.

Microscopic Examination. *Cerebrum* (right third frontal convolution and right temporo-sphenoidal lobe). There is some thickening of the pia, due partly to œdema, partly to infiltration with small round cells. The vessels of the pia are congested. Overlying the pia and connected with it by a fine web of branching cells and fibres is a membrane which in places shows distinctly a division into two or three layers. This membrane consists of round and spindle-shaped cells, with here and there a few very fine fibres; numerous small bloodvessels are seen, and hemorrhages have occurred into the meshes of the membrane, and caught within these meshes are red blood-cells, granular fibrin, and brown pigment. In places there are aggregations of small round cells, whose nuclei, staining very deeply with hæmatoxylin, are undergoing

fragmentation (pus); these cells are found chiefly in the superficial layers of the membrane. At points where there has been considerable extravasation of blood the large branching connective-tissue cells are seen to be loaded with brown pigment.

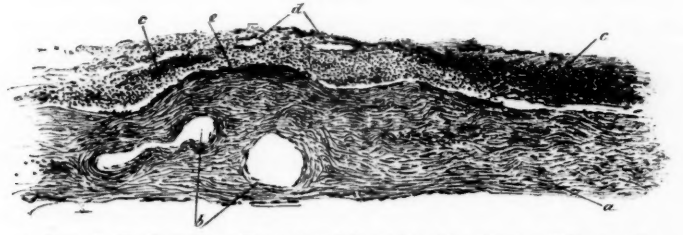
FIG. 1.



a. Dura. *b*. Layers of membrane. *c*. Purulent infiltration. Section through dura and new membrane in Case II.

Dura (near superior longitudinal sinus). The fibres are separated from each other by serous infiltration. The dura is covered by a membrane which in some places is thick, in others shows a subdivision into several layers. The membrane resembles that above described. Penetrating between the fibre bundles of the dura are seen fine strands of young connective tissue. Sections of dura taken from other regions show very extensive hemorrhages and brown pigmentation.

FIG. 2.



a. Dura. *b*. Bloodvessels. *c*. Hemorrhage into meshes of membrane. *d*. New vessels. *e*. Pigment. Section through dura and new membrane in Case II.

These cases illustrate some points in the etiology, clinical history, and pathology of chronic internal pachymeningitis which seem worthy of consideration.

The age of the first patient, five and one-half months, corresponds very nearly to the period of life at which this lesion is most frequent, for of 57 cases in which the age is given, 43 occurred under one year, and of these 34 were not more than six months of age. In a case reported by Northrup,[1] the patient was four years and seven months old, and in one mentioned by Doehle six years, and in another three

[1] Transactions of the New York Pathological Society.

and one-half years. These are the oldest children of whom I have found records. The condition is thus one relating to early infancy.

The majority of infants in whom the lesion is found are badly nourished or cachectic. Rickets was present in at least 13 of 57 cases, and chronic intestinal catarrh in at least 20 of these cases. In eight of Doehle's cases indications of syphilis were present. In the remaninder of the 57 cases there is no record of syphilitic lesions or of syphilitic heredity, but in many of these such heredity cannot be excluded. In a few cases the children have been well nourished and apparently normal a short time before the indications of hemorrhage have appeared. As regards the pathological nature of the lesion we are as much in the dark as in the case of the similar lesion with which we meet in adults. The new membrane must be regarded as originating from the proliferation of dural endothelial cells, or, more probably, from the subendothelial connective-tissue cells, the new and cellular connective tissue being exceedingly prone to the development of new bloodvessels with thin walls. Even in cases which we may suppose to originate from hemorrhage we have to recognize an intimate connection between the organization of the clot and the proliferation of dural connective-tissue cells. In some cases there seems to be little inclination to hemorrhage, in others there are numerous punctate hemorrhages from the delicate vascular membrane which constitutes the inner layer of the laminated structure, and occasionally there is an extensive clot which lies in the subdural space, as in the second case reported. In the first case reported the membrane was extremely vascular, and small hemorrhages occurred into the membrane itself; in the second case the vascularity of the membrane was relatively slight.

The membrane varies much in thickness. In many cases it is so thin and delicate that it is readily overlooked unless the occurrence of the lesion be kept in mind. Sometimes it reaches a thickness of two or three lines. In both the cases reported here the membrane was extensive. In both cases it extended from the calvarium to the basal fossæ, and in one it was especially distinct in the occipital fossæ. Doehle noted that the membrane was especially apt to occur in the basal fossæ. He is strongly inclined to look upon the formation of the membrane as secondary to a meningeal hemorrhage at the time of birth, but the evidence for this view cannot be said to be conclusive. The belief that the lesions of internal pachymeningitis may be the consequence of subdural hemorrhage has recently received some support from Wigglesworth,[1] who pointed out the likelihood of hemorrhage arising from degenerated arachnoid veins in early life. It is stated that the experimental introduction of blood into the subdural space has been followed

[1] Brain, 1892.

by the lesions of pachymeningitis. Although we are in no position to deny that extravasated blood may sometimes occasion the formation of the dural membrane, we cannot reasonably look on this as the explanation of the majority of the cases observed in infancy, in which there have apparently been no clinical signs of meningeal hemorrhage. In our first case, for example, the child was apparently normal until a short time before cerebral symptoms appeared, and the supposition of the existence of a meningeal hemorrhage at birth is hardly tenable. In Case II. considerable pigment was found near the line of attachment of the membrane to the dura, some free, some in the bodies of branching connective-tissue cells. It is not possible to interpret the relation of this pigment to the large hemorrhage, but there is no good reason for thinking that the locality of this pigment, which appears recent, indicates that the membrane originated from a layer of blood on the inner surface of the dura. The old experiments of Kremiansky,[1] who succeeded in producing some of the lesions of convexity internal pachymeningitis in dogs, by means of chronic alcoholic intoxication, indicates that an intoxication may give rise to the formation of a highly vascular membrane consisting of young connective-tissue cells and vessels. In many of the cases recorded in literature there is reason to suspect that pathological blood states may have existed, and that intoxications may have played a rôle in the development of the intradural lesion. But it is so common to find severe intoxications without such lesions that this does not seem a wholly satisfactory explanation. The intoxication theory also fails to explain the occurrence of the membrane in apparently healthy children. It may be that future pathological and clinical observations, together with experimental studies looking especially to the nature of the irritants which are competent to incite the dural connective tissue to proliferation, will show that the lesions with which we meet may be sometimes of inflammatory, sometimes of hemorrhagic origin, or, to be more accurate, will show that hemorrhage is one of the causes of the inflammatory lesion which we call chronic internal pachymeningitis.

In sections from Case II., in which the membrane is less richly cellular and vascular than in Case I., the inner or free edge of the membrane is infiltrated with small spheroidal cells, whose cell-bodies are indistinct and whose nuclei are multiple and usually rounded and very distinct. The cells are probably leucocytes in which nuclear fragmentation has occurred. We are almost justified in speaking of the inner layers of the membrane as being the seat of a purulent inflammation, although the surface of the membrane was not covered with pus. I have met with no description of similar appearances in pachymeningitis, and the coincidence of such an exudative inflammation with the usual lesions of

[1] Virchow's Archiv, Bl. 68.

hemorrhagic pachymeningitis is certainly of much pathological interest. Doehle expresses the belief that the condition of marasmus seen in many of his cases may have been due to a trophic disturbance of the cortex cells dependent on damage by the pachymeningitis. In view of the frequency of intestinal catarrh in these patients Doehle's explanation seems superfluous; but it would, nevertheless, be interesting to look carefully for indications of structural change in the cortex which might be attributable to the influence of the dural lesion.

The presence even of an extensive and moderately thick membrane seems not to entail symptoms. If it does we have yet to learn what they are. It is probably impossible to recognize the condition until hemorrhage occurs, and even then the diagnosis is rarely to be made with confidence. The reported cases are not sufficiently numerous to enable us to study statistically the symptoms that accompany hemorrhage, but an idea may be formed of the character of the usual clinical phenomena. Where small hemorrhages from the newly formed vessels occur into the membrane itself there are probably no obtrusive cerebral symptoms. In a number of such cases the occurrence of a cerebral lesion has not been suspected during life. It is quite likely that slight cerebral symptoms in such cases are masked by the habitual apathy of these very young and usually marantic children. Where a hemorrhage of considerable size occurs, either into the new membrane or chiefly into the subdural space, the symptoms of irritation or compression of the cerebral cortex appear to be seldom absent. The hemorrhage is probably more often one-sided than bilateral, and the symptoms are generally correspondingly unilateral. The most frequent symptoms, where the hemorrhage is large, are rigidity, convulsions, and coma. If the hemorrhage occurs slowly convulsions may be absent, and rigidity with deepening coma constitute the only symptoms. When convulsions occur they may be repeated in groups a few days apart, sometimes owing to the occurrence of repeated hemorrhages of moderate size. Paralysis was noted in only a small portion of the hemorrhagic cases. Contracted pupils were observed in three out of nine cases. Tremor in the side opposite the lesion was seen in the first case. The symptoms of tetany were observed in the second case, and certainly constitute a feature of considerable interest. It is true that the phenomena of Trousseau and of Chvostek were not sought for, but the carpo-pedal spasm was so persistent that so careful an observer as Dr. Holt looked upon the condition as tetany. Carpo-pedal spasm or tetany is not rare without hemorrhagic pachymeningitis, and it does not seem certain that the spasm is in this instance to be referred to the lesion.

The fontanelle is usually bulging at the time of the onset of cerebral symptoms. The temperature is moderately elevated, the pyrexia being probably less than in the case of meningitis. Febrile complications,

however, are so common that the temperature, pulse, and respiration of uncomplicated cases can rarely be studied. In fatal cases the duration of the cerebral symptoms is from a day to a week.

It is evident from the foregoing description of the symptoms of hemorrhagic internal pachymeningitis, that we can hardly hope to make the diagnosis with any degree of certainty. An extensive pial hemorrhage occurring in the course of an acute infectious disease, such as pneumonia, may apparently cause closely similar phenomena. I do not feel certain that there is any symptom or combination of symptoms which we meet in hemorrhagic internal pachymeningitis which we may not occasionally encounter in the course of a severe acute infection without the presence of any cerebral lesion whatever. At the same time hemorrhagic pachymeningitis is a lesion which we should think of as a possibility whenever we meet with unilateral rigidity and convulsions, with deepening stupor, in a cachectic or rhachitic child under one year of age. In the absence of the signs of pneumonia and tuberculosis, I think this diagnosis gains distinctly in probability, as we may then exclude with some confidence an important cause of infantile meningeal hemorrhage and also tubercular intracranial lesions.

Holt[1] has called attention to hemorrhagic pachymeningitis as a cause of the chronic cerebral palsies of children. I do not think it has yet been proven that this is one of the ways in which these palsies arise; but if it be true that children occasionally survive a hemorrhage from pachymeningitis sufficiently long to produce a chronic palsy, the anatomical evidence of this will surely be forthcoming.

One other aspect of internal pachymeningitis in children deserves mention. It is probable that relatively slight traumatisms to the head may occasion the rupture of vessels in a highly vascular membrane. This fact gives these cases a certain medico-legal importance. Doehle reports the case of a careless mother who allowed her apparently healthy infant to fall out of bed. The child was found comatose and died. The autopsy showed that the child had a hemorrhage from a subdural membrane. The question of the influence of trauma may thus arise.

Although it cannot be contended that hemorrhagic pachymeningitis in children is a frequent condition, even in hospitals for children, there are no doubt more examples of it than is generally supposed, and it is likely that its precursor, chronic internal pachymeningitis, is by no means rare. My object has been accomplished if I have succeeded in emphasizing the fact that this condition is worthy of study and not without practical interest.

[1] Diseases of Infancy, 1897.

REVIEWS.

MAMMALIAN ANATOMY. A Preparation for Human and Comparative Anatomy. By HORACE JAYNE, M.D., Ph.D., Director of the Wistar Institute of Anatomy and Biology, Professor of Zoology in the University of Pennsylvania. Part I. The Skeleton of the Cat: Its Muscular Attachments, Growth, and Variations Compared with the Skeleton of Man. With over 500 original illustrations and many tables. Pp. 816. Philadelphia: J. B. Lippincott Co., 1898.

PROF. JAYNE offers in this book, just issued from the J. B. Lippincott Co.'s press in Philadelphia, one of the most important contributions of recent years to systematic morphology. The volume deserves careful consideration from two points of view. In the first place, attentive perusal of the more important portions of the book will convince that Prof. Jayne has produced the most complete and thorough systematic description of the cat's skeleton extant. As a monograph of the osteology of the domestic cat his work will be valuable to comparative anatomists, offering as it does a sound basis for more extended serial study of the osteology of the *felidæ* and of carnivora in general. The details of descriptive anatomy are thoroughly and carefully considered in the text, and the work is profusely illustrated by a series of very handsome and accurate original illustrations of the bones of the cat. Special mention may well be made of the chapters dealing with the skull, face, carpus, and tarsus. The account of the teeth is a model of concise and correct odontological description, the pages on the variations and abnormalities of the teeth being especially valuable. In fact, throughout the entire work the care with which the author has considered the subject of variation will make the book most useful to comparative anatomists. It is a matter of some regret, however, that more stress has not been laid upon the phylogenetic value of the variations described. For instance, the total numerical and group variations of the vertebral column are dealt with in detail, but the student is offered no general data indicating the value of such observations from the stand-point of general morphology. This is especially to be regretted, as Prof. Jayne's book is designed to form an introduction to general comparative and human anatomy.

This brings us face to face with the second aspect in which the book will have to be considered. Prof. Jayne, in his preface, very properly points out the practical difficulty and loss of time encountered by teachers of anatomy, "owing to the fact that none of the existing textbooks sufficiently cover the ground or emphasize the close relationship between the anatomy of the inferior animals and the anatomy of man." The preparation of the volume was undertaken for the purpose of supplying this need. Prof. Jayne's statement gives voice to a feeling which has of late years gained more and more ground among teachers of anat-

omy the world over. The fact, long ignored, or only sparingly and almost reluctantly accepted, is becoming recognized, that sound instruction in the anatomy of the human body cannot be attained without utilizing to the fullest extent the aids which comparative anatomy and embryology so abundantly offer. This conviction has led in Germany to the publication, just undertaken, of the extensive work on human anatomy, now being issued under the editorship of Prof. Bardeleben, and we welcome Prof. Jayne's work as evidence that similar convictions are gaining ground among scientific anatomists on this side of the Atlantic. However valuable the present volume may, and unquestionably will, prove to the systematic comparative anatomist, as a complete osteological monograph of the cat, this second and broader purpose of its publication will determine its future standing among the productions of similar intent which will undoubtedly follow. In one way the limitations which Prof. Jayne has set himself in his work make it impossible to judge it by the standards which will have to be adopted in the future. Comparative anatomy and embryology, if they are to be of true service in the preparation for or in the actual pursuit of the study of human anatomy, must of necessity deal with broad divisions of the subject. Knowledge of direct use in the interpretation of the human structure must be drawn from the study of a number of individual forms, each furnishing morphological facts and data capable of being used separately or in serial combination in elucidating the peculiarities of man's structure and his phylogenetic position in the mammalian series.

Hence a monograph dealing exhaustively with the anatomy of a single mammalian species, while it gains in completeness and accuracy *as a monograph*, loses correspondingly in plasticity, and becomes less of a commentary on and an aid to the study of the structural conditions found in higher forms.

The value of Prof. Jayne's work will have to be judged with these natural limitations which the scope of the volume carries with it.

Turning to details, the arrangement of the subject matter of the book calls for consideration.

The introductory chapter (p. 48) offers an excellent account, well adapted to beginners, of the general plan of the vertebrate body and of the skeleton in particular. The parts dealing with the question of anatomical nomenclature are especially lucid and concise, and well selected as regards range and subject matter. It would have been preferable if the author had not refrained from giving a precise definition to the terms "external" and "internal" as applied to the body-cavities and walls. This could have readily been done in connection with the admirable terminological diagram of a transection of the body (Fig. 12).

The pages dealing with the development and structure of the joints are excellent. The description might, however, with advantage have been amplified by considering the character and derivation of intra-articular disks and ligaments in connection with joint-formation, especially with a view toward adapting the book to the needs of preliminary students of anthropotomy. The same might be said in regard to the simpler principles of diarthrodial mechanics. It is to be remembered, however, that the plan of the entire work is a strictly systematic one, and that in all probability one of the succeeding volumes dealing with arthrology will take up all such details.

Figure 8 is to be deplored as indicating a covering of opposed diar-

throdial articular cartilages by a synovial membrane, thus perpetuating the "closed sac" theory.

In the body of the book the detailed systematic osteological descriptions are uniformly clear and to the point. If a fault is to be found it lies in the fact that general morphological considerations have been to a large extent subordinated to descriptive details. For instance, it would have been preferable, in our opinion, to bring out (p. 116) distinctly the value of the costal elements and transverse processes in the general consideration of the vertebral column, rather than base the comparison of the cervical group with the remaining vertebral segments upon the behavior of "dorsal" and "ventral" "elements." While to the trained anatomist the author's meaning is at once apparent and the correct grouping of the vertebral segments easily obtained from the text, yet, as the book is primarily intended for beginners, it would lose nothing if the cardinal morphological facts were grouped together in a more forcible and definite manner.

The same criticism might, for example, be made in reference to the treatment of the morphological significance of the dorsal and ventral sacral foramina. We regret that the excellent schematic transection of the sacrum (Fig. 71, p. 100) has not been made the base for a more complete and clear definition of the relation between the sacral and the intervertebral foramina.

In the cardinal matter of the comparison between the bones of the cat and the corresponding parts of the human skeleton, we confess to a distinct sense of disappointment.

In the first place, the illustrations of human osteology used in the book are far inferior to the original drawings of the cat's bones. They are apparently largely reproduced from Leidy's work on human anatomy, but they are not up to modern standards of illustration, and fail to answer the purpose for which they are intended in this book. Much would have been gained by the direct juxtaposition of the human bones and the bones of the cat, drawn in the same position and from the same point of view, and correspondingly labelled. It would have been of distinct advantage, for instance, if the excellent plan of indicating the position of the principal bones of the cat's skull in heavily shaded outline had been extended to the human skull. As it is, the student who utilizes his knowledge of the cat's skeleton will experience, in beginning his study of human osteology, difficulty in correctly placing and interpreting corresponding parts.

In the same sense a closer union of the portions of the descriptive text dealing with the bones of the two forms would seem to us desirable. The value of comparative anatomy to the student of anthropotomy lies in this very close and immediate application of his knowledge of the structure of lower forms to the structure of man. The medical student especially requires that the aid which comparative anatomy can afford him in his studies should be immediately and directly available.

It is, of course, impossible that in a work of this size and character opinions should not differ as to the value of some of the methods of treating the subject. We desire, however, to reiterate our conviction that scientific morphologists will heartily welcome Prof. Jayne's book as a timely departure from old-established lines, and we extend our congratulations to him on the general excellence of the first volume of his series. G. S. H.

TRAITÉ DE MÉDECINE ET DE THÉRAPEUTIQUE. Publié sous la direction de MM. P. BROUARDEL et A. GILBERT. Tome quatrième. Maladies du Tube digestif, Maladies der Péritoine. Paris: J. B. Baillière et fils, 1897.

TREATISE ON MEDICINE AND THERAPEUTICS. Edited by BROUARDEL and GILBERT.

THIS volume (for review of Volume I. see THE AMERICAN JOURNAL OF THE MEDICAL SCIENCES, August, 1897, p. 207) well sustains the high standard of the system, although, on account of the nature of the subjects considered in it, there is not so much originality of method. It contains articles on the "Diseases of the Mouth and Pharynx," by J. Teissier and G. Roque; "Diseases of the Œsophagus and Intestines," by L. Galliard; "Diseases of the Stomach," by G. Hayem and G. Lion; "Intestinal Worms," by A. Laboulbène; "Dyspepsia and Diarrhœa of Infants," by V. Hutinel and Thiercelin, and "Diseases of the Peritoneum," by E. Dupré.

In the arrangement of the various sections novelty is not attempted; and apparent inequalities of space, some of which are mentioned below, have no doubt been designed. Some idea of the methods pursued may be gathered from the following extracts from the chapter on Buccopharyngeal Diphtheria. The monobacillary toxic and the polymicrobic infectious forms are separated with great distinctness, the diagnosis, of course, to be made on bacteriological grounds. The serum treatment is to be used as soon as a clinical diagnosis is made, without awaiting the result of cultures. The dosage of serum is stated in cubic centimetres (20 to 40) instead of the only scientific dosage by antitoxic units. The larger doses are used in the polymicrobic cases, on account of the increased virulence of the specific germs. In common with many Continental authorities, the authors advise against the local use of carbolic and bichloride solutions, though admitting milder antiseptics. The immunizing use of antitoxin is also advised.

The section on Diseases of the Stomach, covering 335 pages, is, on the whole, the best in the book, forming really a monograph representing the most recent views of Prof. Hayem, and especially valuable for that reason. The methods of examination are described with great fulness in the beginning, including the use of the gastrodiaphane and the gastroscope (that of Mikulicz only is mentioned). Thirty-four pages are given to chemical methods and their indications, with a brief historical note, giving essentially a résumé of the methods of Hayem and Winter. This is followed by chapters on Symptoms, such as dilatation, vomiting, hemorrhage, etc., and on the remote effects of gastric disease, both general and as affecting organs. Under special pathology, gastritis occupies an important place, having no less than eighty-eight pages. The interesting historical development of the subject, especially in France, is well described; the various anatomical varieties and their clinical characteristics are fully explained; the relations to other, especially nervous, diseases, are made clear. Finally, the anatomical and chemical diagnosis is elucidated; for the authors, unlike some of their followers, do not think that gastric pathology can be represented by simple algebraic formulæ. "Embarras Gastrique," rarely mentioned in English literature nowadays, is described as a syndrome dependent on many affections, general and local, and its relations to gastritis, acute indigestion, and typhoid fever are considered.

Passing to diseases of the intestines we find the general plane of excellence preserved, although many of the chapters, especially those on Enteritis of various kinds, are disproportionately short. Appendicitis is well described within rather narrow limits. The author is not altogether ignorant of work done outside of France. But where did he find "les Américains" who recommend exploratory puncture? The chapter on Parasites is also well done. The authors repeat the groundless statement that Chabert, Duncan, and Lyell "have seen" ankylostoma in the United States. Least satisfactory of all is the short chapter on Intestinal Diseases of Infants. The authors seem to have a very uncertain grasp of the peculiar features expected in such a chapter. That on Peritoneal Disease, on the other hand, is admirable, though too short.

On the whole the book is a good example of works of its kind. Physicians who depend on the English language for information will miss nothing essential if the work is never translated; but those who like to note the differences of view in different countries, and to see how various ways may in practice lead to the same end, will find this a convenient, well arranged, and not too verbose guide to French practice at the present time. G. D.

A TEXT-BOOK OF THE DISEASES OF WOMEN. By HENRY J. GARRIGUES, A.M., M.D., Professor of Gynecology and Obstetrics in the New York School of Clinical Medicine, etc. Containing 335 engravings and colored plates. Second edition, thoroughly revised; pp. 728. Philadelphia: W. B. Saunders, 1897.

THIS book, written alike for undergraduates and graduates, aims to give American modes of treatment and ideas. It reflects the large experience of the author, both as a clinician and a teacher, and comprehends much not ordinarily found in text-books on gynecology. We think too much space has been given to the consideration of anatomy for a work of this kind. While the illustrations are excellent and the text clear and concise, we feel that this chapter is of little practical use, as a thorough knowledge of the subject can only be obtained in the dissecting-room with the aid of a good work on anatomy.

The book has already taken its place among the best works of its kind, and we are glad to welcome it in this its second edition. The work of revision has been carefully performed. As the author states in his preface, patterns of old-fashioned instruments have been replaced by new ones; some of the original illustrations have been improved or redrawn and many new illustrations have been added. Aseptic surgery has been more carefully considered. The Surgical Treatment of Uterine Fibroid and Cancer has been rewritten and much simplified. Vaginal Section has been given that attention which its growing popularity demands.

The book is one of the most complete treatises on gynecology which we have, dealing broadly with all phases of the subject. For this reason we feel that it will be of more value to the specialist than to the undergraduate or general practitioner.

Parts I. and II. of the first section, which are devoted to the devel-

opment of the female genitals and to the anatomy, are elaborate in completeness and are well illustrated. We are tired, however, of seeing such elaborate illustrations of the Hottentot apron as are now appearing in almost every work on gynecology. Here it is honored by a full-page colored plate, and a very poor one at that. Too much praise cannot be given to the chapters on Diseases of the Fallopian Tubes and the Ovaries. They have been brought thoroughly up to date and are written in such a scholarly and masterful manner that the study of them becomes a treat. We congratulate the author upon the success of his first edition, and predict for the present one an equally gratifying reception. J. S.

THE DISEASES OF WOMEN: A HANDBOOK FOR STUDENTS AND PRACTITIONERS. By J. BLAND SUTTON, F.R.C.S., England, and ARTHUR E. GILES, M.D., B.Sc. London, F.R.C.S., Edinburgh. Philadelphia: W. B. Saunders.

THIS small volume of 422 pages is, as its title implies, intended for students, and, as it doubtless expresses the views of its well-known authors, we predict for it a favorable reception in Great Britain. The teaching which it advocates, however, is so different in many respects from that which is received in this country that it can never become a popular book on this side of the water.

Very little space is devoted to the consideration of plastic gynecology, and the operation advocated for the repair of the perineum is one which has been long abandoned. The authors advocate Tait's operation and make no mention of Emmet's method, which has become so popular here.

The general consideration of abdominal operations and technique, and the chapters devoted to the diseases of the ovaries, tubes, and uterus, can be highly commended for clearness of style and for conservatism of teaching.

Many of the illustrations are excellent, and the general impression given by the book is pleasing. J. S.

ST. BARTHOLOMEW'S HOSPITAL REPORTS. Vol. xxxii., 1896. London: Smith, Elder & Co., 1897.

THIS volume contains one paper which, although not treating of any one distinct medical or surgical affection, is of especial interest; it is entitled "Clinical Aphorisms from Dr. Gee's Wards." They are classified under special headings—*e. g.*, Phthisis, Pneumonia, Heart Disease, Nephritis, etc.—and form a collection well worth careful study and thought. We find expressed in them many views differing from those common in this country, and they set forth certain English ideas of medicine more clearly, perhaps, than it is easy to obtain so succinctly in any other form. We wonder how many American physicians would

agree with this aphorism (No. 65): "The heart-murmur called after Austin Flint, if it really occurs at all, is very rare. Only three or four well-marked cases have been recorded." As the murmur is due to a condition which cannot well be demonstrated post mortem, there may be differences of opinion as to the causation of the murmur, but we believe that it is not so infrequent as Dr. Gee teaches. How many of us, again, remember or believe that, "having excluded calculus, hæmaturia in people who are past middle life is most commonly due to granular kidneys"? (Aphorism No. 95.) In speaking of influenza, Dr. Gee remarks, "there is nothing in the symptoms or signs of influenza which enables you to say 'that is influenza.' It is often best, if the patient has had a previous attack, to consult his own feelings in the matter;" this seems to us a very apt saying, when we think of the extensive semeiology of this disease. How can we account for the fact that "the enormous quantities of food which diabetics sometimes consume, to satisfy excessive appetite which occasionally occurs as a symptom of the disease, never seem to cause dyspepsia? The food is easily digested; indeed, there seems to be quite an exceptional development of the digestive function in these cases." (Aphorism No. 224.) We might quote many more, but these are sufficient to characterize their importance. Dr. West reports a curious case of "Profuse Uncontrollable Diarrhœa in a Man Recently Returned from the Tropics," where no cause for this condition could be discovered; the "diarrhœas," speaking generally, are certainly one of our stumbling blocks, both as regards etiology and treatment, but it is to be hoped that in the future either by antitoxins or antisepsis we may be able to accomplish more than we do now in saving cases.

In relation to the valuable paper by Dr. Herringham "On the Occurrence of Rigor and Collapse in Typhoid Fever," there is also reported in this volume a case by Dr. Church where rigors were a most marked symptom all through the attack; the temperature-chart is given, which is not at all typical of typhoid, though we do not mean to imply for a moment that we question the diagnosis, but merely wish to draw attention to this anomalous case. There is a very careful study by Drs. Holmes and Kanthack, "On the Relationship of Cardiac Hypertrophy and Œdema to Chronic Renal Disease," worked out from the post-mortem records; the results do not disclose anything new, but the importance of the paper rests on the analysis of a large number of cases; they conclude that "this points directly to our belief that renal œdema is more commonly met with in the earlier forms of parenchymatous or tubal nephritis, and that as the lesion becomes chronic and more interstitial tissue develops, the œdema disappears, while at the same time also the albuminuria and oligæmia gradually lessen until they almost or completely vanish." The majority of the papers in this volume deal with medical subjects, and there are only two or three on surgical topics or cases. There is no article that we should wish to see omitted, which is the highest praise we can bestow on these reports, for whether it be a case reported or a longer study of some morbid condition, each paper is valuable in itself either from its subject or manner of presentation.

It is needless to speak of the elegance with which the report is printed, both as regards type and paper, except to stimulate American publishers to greater nicety in printing reports from institutions in this country.

R. N.

TEXT-BOOK OF PHYSIOLOGY. Edited by E. A. SCHÄFER, LL.D., F.R.S., Jodrell Professor of Physiology, University College, London. Vol. I. Pp. 1036, with 3 plates and 92 figures in the text. Edinburgh and London: Young J. Pentland; New York: The MacMillan Company, 1898.

IT is about twenty years since the celebrated *Handbuch der Physiologie*, in six volumes, edited by Prof. L. Hermann, was published in Germany. The articles comprised in that work were written by physiologists who were representative investigators and authorities in their special line of study, and in consequence these volumes became veritable storehouses of information, to which many teachers and investigators have turned ever since. But a space of twenty years could not elapse without bringing to light many new facts and many new interpretations of old facts. In addition, the size of the *Handbuch* and the fact that it was written in the German language have certainly limited the number of those teachers and investigators who directly consulted its authoritative statements. To remedy these defects for the English-speaking physiologists, or, in other words, to produce an English book which, being fully abreast of modern physiology, would give full, precise, and authoritative information, together with references to the original authorities, has been the object of the editor and his collaborators of this work, the first volume of which lies before us. It is a book, therefore, written for the advanced student of physiology, for investigators and for teachers.

As an enormous amount of literary labor is required for the production of such a work, the different subjects which collectively constitute the modern science of physiology are treated by different authors, all of whom are leading physiologists in Great Britain and well known for their original investigations and general knowledge of physiological science. The present volume deals with the following subjects: "The Chemical Constituents of the Body and Food," by W. D. Halliburton; "The Blood," by E. A. Schäfer; "Hæmoglobin," by A. Gamgee; "A General Account of the Processes of Diffusion, Osmosis, and Filtration," by E. W. Reid; "The Production and Absorption of Lymph," by E. H. Starling; "Chemistry of the Digestive Processes," by B. Moore; "The Salivary Glands," by J. N. Langley; "Mechanism of Secretion of Salivary, Gastric, Pancreatic, and Intestinal Juices," by J. S. Edkins; "Mechanism of Bile Secretion," by D. N. Paton; "The Chemistry of the Urine," by F. G. Hopkins; "The Mechanism of the Secretion of Urine," by E. A. Starling; "The Mechanism of the Secretion of Milk," by E. A. Schäfer; "Secretion and Absorption by the Skin," by E. W. Reid; "Chemistry of Respiration," by M. S. Pembrey; "Animal Heat," by M. S. Pembrey; "Metabolism," by E. A. Schäfer; "Internal Secretions," by E. A. Schäfer.

It is evident that in the treatment by different authors of subjects so closely related as some of the above, it is almost impossible to prevent overlapping, and hence in some places repetitions are to be found. But as the subjects are always looked at from different points of view, these repetitions do not disturb the unity of the work. The impression of unity, moreover, is especially maintained by the harmony of views expressed by the different writers, and likewise by their manner of treatment and the proportion observed in each section. It must be observed, however, that the article on "Hæmoglobin" seems almost too elaborate

and detailed for a text-book of two volumes. Of course, all the new methods and instruments of precision are mentioned. We see a description of Oliver's apparatus for estimating the number of red blood-corpuscles, and of his hæmoglobinometer, both of which will be found extremely convenient and useful for clinical purposes. We find a fine description of the theory and method of spectrophotometry, and of the Band of Soret or band γ of hæmoglobin in the extreme violet part of the spectrum. The illustrations are good and have not been employed too profusely; indeed, at some places a few more might have been used with advantage.

Throughout the work we see evidence of a critical and scientific mind which, for example, regards it "at least probable that a process considered to-day as a 'vital action' may in the future become capable of a simpler explanation," p. 283; which regards the reasoning for the existence of trophic nerves, p. 529, and for separate heat centres, p. 865, in the brain as far from being conclusive.

Two indices of about seventy-five pages greatly enhance the value of this volume. A. P. B.

THE YEAR-BOOK OF TREATMENT FOR 1898: A CRITICAL REVIEW FOR PRACTITIONERS OF MEDICINE AND SURGERY. Pp. 484. Philadelphia and New York: Lea Brothers & Co., 1898.

THIS welcome digest comes to us, the product of the same corps of contributors with the substitution of Dr. G. A. Gibson (Diseases of the Heart and Circulation), and Dr. Herbert P. Hawkins (Diseases of the Stomach, Intestines, and Liver). These departments are certainly presented with the same high standard of intelligent criticism as their predecessors. While much in this volume is familiar to those who read attentively the department of Progress in this JOURNAL, the form in which the matter is presented is convenient and the editorial comments judicious. We have during many years made use of the former issues for reference, and have invariably found that they were more satisfactory than some more pretentious, but less carefully selected, reviews.

R. W. W.

PROGRESS

OF

MEDICAL SCIENCE.

THERAPEUTICS.

UNDER THE CHARGE OF

REYNOLD W. WILCOX, M.D., LL.D.,

PROFESSOR OF MEDICINE AND THERAPEUTICS AT THE NEW YORK POST-GRADUATE MEDICAL SCHOOL AND HOSPITAL; VISITING PHYSICIAN TO ST. MARK'S HOSPITAL.

The Treatment of Constipation.—DR. ALBERT ROBIN recommends sodium sulphate not only for its laxative properties, but because it relatively is peptogenic—seventy-five to one hundred and fifty grains in a half-glass of water during the meal. Magnesium hydrate if used for a long time is likely to irritate the bowels, cause colicky crises, and favor abnormal intestinal fermentation with increase of indican in the urine. Finally, it is strongly alkaline and may give rise to considerable magnesium carbonate, which may irritate the bladder. In spite of the usual repugnance to drastic cathartics, pills of aloes or of aloes and cinchona are useful. Socotrine aloes should not be specified, for none are to be found in commerce. Massage, which has for its purpose the emptying the large intestines, merits further use. Of the mineral waters, Châtel-Guyon, Brides, Aulus (source Darmagnac) are preferred. As for diet, it is important to note that many patients pass albumin in their urine two or three hours after eating, but not at other times. Therefore the amount of proteids should be limited to that which can be thoroughly oxidized.—*Bulletin Général de Thérapeutique*, 1898, 16e liv. p. 593.

Demorphinization.—M. PAUL SALLIER records the usual symptoms which appear when morphine-addiction is suddenly checked. Two theories have been advanced to account for these symptoms: (1) That morphine is changed by the oxygen of the blood into oxymorphine, which is poisonous. This oxymorphine is set at liberty when further ingestion of morphine is prevented, and causes the various symptoms. (2) Under the continued action of morphine the glands of the stomach cease to act. When morphine is taken away they recommence their activity, with the result that the stomach is inundated with acid gastric juice. This is the acid theory for the production of symptoms. The author presents his own: That morphine acts upon the glands in two ways: (1) Paralyzing the afferent nerves, and (2) impregnating

their cells. When morphine is stopped these glands renew their activity, although they are no longer in a normal condition. The cells of these glands and their excretory ducts are so modified that they are incapable of secreting readily, and they become swollen and painful. The retention of their contents is further embarrassed by the clogging of the ducts by detached endothelial cells from the glands and ducts. Later relief follows the evacuation of this material, with regeneration of gland and duct epithelium. This theory explains the eliminatory crises, the advantage of rapid removal of the drug, the uselessness and danger of so-called calmants and substitutes, and the severity of relapses during cure.—*La Presse Médicale*, 1898, No. 34, p. 201.

The Treatment of Inoperable Sarcomata.—Dr. C. Mansell Moullin has made use, in ten instances, of a fluid composed of the products of the growth of the streptococcus of erysipelas and the bacillus prodigiosus, sterilized by heat. After noting that the results obtained by different observers vary a good deal, the opinion of a committee appointed by the New York Surgical Society is quoted. They found: (1) That the danger to the patient from this treatment is great; (2) moreover, that the alleged successes are so few and so doubtful in character that the most that can be fairly alleged for the treatment by toxins is that it may offer a very slight chance of amelioration; (3) that valuable time has often been lost in operable cases by postponing operation for the sake of giving this method of treatment a trial; and finally and most important, (4) that if the method is to be resorted to at all it should be confined to the absolutely inoperable cases. The point, of course, is in the second finding. No one has ever advocated or practised this method upon patients who were suitable for operation. Some successful instances of the use of this method have been verified, and one single positive result is worth any amount of negatives. There are, however, certain conclusions which, though some of them may have to be modified later, appear to be justified at present: (1) It cannot be denied that there is a considerable number of instances in which sarcomata that had been given up as hopeless, often after repeated operations, have absolutely and entirely disappeared under this method of treatment. There is no other method of treatment (except infection with the streptococci of erysipelas itself) of which this can be said. (2) Some of these patients have remained free from recurrence for upward of three years, the period which, in the case of excision of the breast from scirrhus, is regarded by many operators as justifying the use of the term cured. (3) In several of the instances in which sarcomata have disappeared after an attack of erysipelas the patients have remained free from recurrence for seven years and upward. (4) The fact that there may be a few, a very few, instances recorded in which sarcomata have disappeared, either spontaneously or after such diseases as acute specific fevers, has nothing to do with these conclusions. (The statement that sarcomata do occasionally disappear is repeated with great regularity, but well-authenticated cases in which this has taken place are very difficult to find.) (5) Nor are these conclusions in any way invalidated by the fact that injections of the mixed toxins are sometimes followed by the disappearance of other growths, such as lupus, keloid, syphilitic deposits, carcinomata, etc. It may make the disappearance of sarcomata more difficult to understand, but it in no way disproves it. (6) The pro-

portion of instances of sarcomata that are cured by the injection of the mixed toxins depends among other things upon the histological character of the growths. Spindle-celled sarcomata are by far the most successful. This suggests the conclusion that the mixed toxins have a selective action even if it is not specific. (7) The disappearance of sarcomata is not due to inflammation, but to an intensely rapid form of fatty degeneration comparable only to that which affects the hepatic cells in acute yellow atrophy of the liver. Inflammation and sloughing, when they do occur, are septic complications. (8) Degeneration and absorption may occur whether the toxins are injected directly into the tumor or into some distant part of the body. In the former case, however, the effect is more rapid and the constitutional symptoms more severe. (9) The method is attended by a considerable degree of danger. It should, therefore, only be adopted in those cases for which there is no other remedy. The chief risk appears to be from collapse and pyæmia. There must always be danger of the latter if there is a suppurating or a sloughing sore. It may be argued that patients whose lives are immediately threatened by a malignant growth will never be cured by any remedy that does not involve some degree of risk. (10) The toxins are of no use unless the cultures are taken from a virulent case of erysipelas or are made virulent by passing the streptococcus through rabbits. (11) The bacillus prodigiosus, in spite of theoretical objections, has the effect of immensely increasing the reaction. (12) The effect is most striking in the case of rapidly growing sarcomata. Slowly growing ones appear to have much more resistance. Probably this merely means that masses of embryonic cells with little organization give way to injurious influences more readily than those that are more closely knit together. (13) Patients often gain in weight and strength while under treatment. (14) Treatment should be continued until the whole growth has vanished or has become so small that it can be removed. (15) If there is a recrudescence of the disease it does not follow that the toxins will be as efficacious the second time as they were the first. Whether this is the result of tolerance having been established cannot be said. (16) Recurrence in other parts of the body may take place after many years. (17) The severity of the reaction is very variable. Probably this depends upon the rapidity with which the injection is absorbed rather than upon any cumulative action it may possess. Coley suggests that injections of the mixed toxins may be useful in preventing recurrence after sarcomata have been removed by operation. Incidentally it may be mentioned that injections of the streptococcus of erysipelas apparently never cause suppuration. If, therefore, the streptococcus of erysipelas is identical with the streptococcus pyogenes the name of the latter had better be changed.—*The Lancet*, 1898, No. 3884, p. 354.

Soluble Metallic Silver.—Dr. B. Credé presents the formula of *Unguentum Credé* as follows: 15 per cent. of soluble silver is incorporated in lard by the same method as is the mercury in gray ointment, and to the product 10 per cent. of wax is added. The ointment is flavored with benzoinated ether. From twenty to thirty minutes are required for inunction. This ointment is useful in acute suppurative processes, as phlegmon, lymphangiectasis and lymphadenitis, septicæmia, commencing osteomyelitis, phlegmonous angina, furunculosis, erysipelas, puerperal fever, gonorrhœal and articular rheuma-

tism. In general sepsis, or when inunctions are not practicable, it may be given internally as a pill: soluble silver, ⅛; sugar of milk, 1½ gr.; glycerin, 1½ m., with sufficient water. Two of these may be administered twice or thrice daily, followed by from three to six ounces of boiled water or tea. These are suggested as being tonic, do not interfere with digestion, and in addition to sepsis may be of use in tuberculosis. Pencils of three grains each are useful for fistula. In solution, 1 or 2 to 10,000, it may be used for irrigation. Of the strength of 1 to 500–2000, in severe sepsis it can be administered intravenously after the method employed by Baccelli for mercurial solutions. Several patients have been under observation who have received fifteen grains of this substance daily for weeks without unpleasant after-effect or the appearance of argyria.—*Klinisch therapeutische Wochenschrift*, 1898, Nos. 14, S. 460, 15, S. 495.

[This allotropic form of silver has been known to photographers, notably H. Carey Lea, for many years. From the therapeutic stand-point it has a peculiar interest. Several months ago a hospital patient who presented numerous pustules upon the cheek and neck, the result of a suppurative otitis media, was entirely relieved by the use of the ointment, even before the ear was cured. We are of the opinion that this substance merits further investigation.—R. W. W.]

The Abortive Treatment of Erysipelas.—Dr. Labit recommends a 10 per cent. solution of iodol in collodion. The affected area is thoroughly painted with this and the coat extended for an inch over the healthy skin. If the hairy scalp is invaded, it is first carefully shaved, then painted. That the iodine contained in the iodol is absorbed is shown by its appearance in the urine. Frequently within twenty-four hours all symptoms of the disease will disappear. It is not claimed that iodol is the only specific for the streptococcus of Fehleisen; doubtless other antiseptics can produce the same result. The pressure produced by the collodion, and its penetration, carrying with it the remedy into the tissues, is important. The method is not painful, but, on the contrary, is anodyne. The results tend to show that at first the disease is local, and, since this is so, no general treatment has been employed.—*Bulletin Générale de Thérapeutique*, 1898, 14e liv. p. 540.

The Action of Organs upon Strychnine.—M. H. Roger takes as his text the well-established fact that different parts of the organism possess the property of arresting alkaloids, modifying them, and diminishing their toxicity; in fine, of exercising a protective action against poisoning. The results of his experiments show that strychnine is about three or four times less poisonous when it is passed through the lungs than when it enters directly into the systemic circulation, as when injected directly into the aorta. This is, however, a special instance of a general law, for the function designated as antitoxic is not the exclusive property of a single organ or tissue. While all the organs, tissues, and cells may be capable of combating intoxication, there are certain parts of the organism which, because of their activity or their situation, are of principal importance. For instance, if a poison is introduced into the alimentary canal it is modified by the intestinal epithelium; if it passes this barrier it finds in the liver a most efficient protector

of the organism. In fact, in this respect no other organ compares with it. If, however, some portion of the poison has escaped its vigilance it is carried by the blood current into the lungs, whose protective action has been mentioned above. As it passes through this organ it is then distributed throughout the economy. If, on the other hand, absorption takes place from the peripheral veins, that is from subcutaneous injection, the liver acts too late, and it is the lung, the first organ traversed, upon which devolves the rôle of protector. This function of the lung deserves further study.—*La Presse Médicale*, 1898, No. 32, p. 185.

The Treatment of Bradycardia.—Dr. R. Douglas Powell points out that one form sometimes follows upon the rapid heart of exophthalmic goitre. It is very commonly associated with well-marked myxœdema, and may continue, notwithstanding the disease has been cured or held in check by thyroid treatment. When found in epileptics the rhythm is not only slow, but frequently irregular. As a temporary condition it is not infrequently met with as a sequel to influenza, and also in association with the stage of depressed temperature that frequently follows upon other fevers. Chronic high arterial tension is generally associated with a slow, sometimes very slow, pulse, whereas in acutely raised tension the action of the heart is generally quickened. In chronic bradycardia, a condition that tends to remain permanent and does not necessarily shorten life, an occasional twenty-four hours' rest in bed should be enjoined, and for mental work the recumbent posture should be preferred. In the more temporary variety the combination of strychnine with an alkali or potassium iodide (the two drugs being kept in separate bottles) is a very useful one. Caffeine also may be employed, especially if the urine is scanty. A five-minute inhalation of oxygen three or four times daily is a valuable cardiac stimulant. In myxœdema thyroid extract will be given, but it is not wise to push it to the production of any excitement of circulation.—*British Medical Journal*, 1898, No. 1943, p. 805.

Acetylene; the Dangers Arising from its Inhalation.—Dr. Thomas Oliver has directed his experiments toward an investigation of the poisonous properties of this new illuminant, when inhaled, as compared with coal-gas. In the latter death supervenes by asphyxia, owing to the carbon monoxide, so largely present in this gas, entering into stable combinations with the hæmoglobin of the blood, from which it is with difficulty dissociated. If a rabbit is placed in a bell-jar into which ordinary air and acetylene are pumped, the animal seems for a very long time to experience very little inconvenience. It is not until ordinary atmospheric air is excluded and only acetylene admitted that symptoms gradually and slowly develop. This circumstance shows that so long as there is any oxygen in the aërial medium by which the animal is surrounded, it is the oxygen which is absorbed in the blood, and very little acetylene. After a more lengthened exposure to actylene than that which is necessary for coal-gas, the animal becomes intoxicated, it falls over on its side, apparently profoundly asleep, and while all through the experiment its breathing has been somewhat short and rapid, stupor steals over the animal, apparently painlessly, for there is not exhibited anything of the excitement, nervous or respiratory, which is seen in the narcosis produced by

such poisonous vapors as carbon bisulphide or benzole, or even in ordinary asphyxia. Where somnolence has been induced and asphyxia not pushed too far, the rabbit, when removed from the bell-jar and placed in ordinary atmospheric air, begins to move about in a few seconds in as lively a manner as if it had not been interfered with, there being neither weakness nor paralysis of its limbs. In a word, a few inhalations of atmospheric air are sufficient to restore to the animal all its faculties. Should the inhalation have been pushed further, and the animal have been very deeply asphyxiated, death may ensue, the cyanosis hitherto observed being rapidly replaced by extreme pallor. In the minor and easily recoverable stages of asphyxia the vascular tension is still maintained, and there is no difficulty in obtaining a drop of blood for examination; but when the deeper stages are reached, so extremely contracted are all the vessels that it is almost impossible to obtain even a trace of blood. When this stage has been reached recovery is difficult. It is interesting at this point to mention that when the blood of a rabbit at different stages of intoxication from acetylene is examined, and especially in the deepest asphyxia, this fluid on spectroscopic examination always exhibited two well-marked bands of oxyhæmoglobin; also that, unlike the blood in coal-gas poisoning, although resembling it in the cherry-red color which it presented, it was readily reduced on the application of ammonium sulphide and gentle heat. To that extent, therefore, if the asphyxia caused by acetylene is not too profound—and under ordinary domestic circumstances it would not be a pure acetylene atmosphere that would be inhaled by an individual, but one mixed with a large proportion of ordinary air—the danger to life seems to be less than it would be in coal-gas poisoning, and the prospect of recovery by removal to atmospheric air greater. Death may supervene, however, if the inhalation has been lengthened and atmospheric air excluded. A rabbit which was profoundly asphyxiated by acetylene, whose lips were extremely pale, its arteries comparatively empty, pupils widely dilated, breathing short and irregular, and muscles completely paretic, died after removal from the bell-jar, death being preceded as in anæmia of the brain, by opisthotonos and convulsion, first in one of the forelimbs, then of the hind, and subsequently the tremors became general. The rabbit died long after its removal from the acetylene atmosphere, after it had been breathing for twenty minutes ordinary air superficially and irregularly. The condition of the heart found at the necropsy is scarcely that observed in asphyxia; some other factor, therefore, contributed to the death of the animal.—*British Medical Journal*, 1898, No. 1947, p. 1069.

An Eruption Due to Exalgin.—M. G. Linossier remarks the great rarity of cutaneous manifestations after ingestion of this drug. This patient, who could not take antipyrin because of the erythema which it caused, received about four grains of exalgin for the relief of headache. An hour after a general erythema appeared. The following day the body was covered with round, brilliantly red, papular areas of considerable size. Upon the back of the hands and in the digital interspaces the elevations seemed to be ecchymotic. Later the epidermis was separated and bullæ containing a colorless liquid appeared. Pressure upon the papular areas caused severe pain, although there was no marked itching. After the bullæ disappeared severe pain was

felt at their site. There was also marked burning pain throughout the entire length of the alimentary canal, and erythematous patches were seen upon the gums. All these manifestations disappeared within three or four days. —*Bulletin Générale de Thérapeutique*, 1898, 13e liv. p. 492.

Bacteriuria.—Dr. Edmund Bonn reports an instance of chronic deep urethritis and follicular prostatitis. He administered internally sodium salicylate, benzoic acid, and salol, with large quantities of water (three pints to two quarts), and finally irrigated the bladder with potassium permanganate (1 to 1000) and corrosive sublimate (1 to 10,000). These were unavailing. The best results were obtained by the use of diuretic infusions and fifteen to thirty grains of urotropin daily, although even this did not entirely clear the urine.—*Prager medicinische Wochenschrift*, 1898, No. 18, S. 208.

The Applications of the Gastric Juice of the Dog.—M. Frémont has obtained benefit from this substance in cholera nostras, chronic enteritis, and old dyspepsias. Several excessively emaciated patients gained weight rapidly. This remedy is contraindicated in the presence of an excessive amount of hydrochloric acid and in cancer. All of the patients treated had been for some time upon a regulated diet without benefit. Suggestion would not explain the beneficial results because the majority of patients did not know what they were taking. The juice was administered during the meal either clear or in beer. The doses varied according to the acidity of the stomach-contents of the patients. The average dose was two ounces.—*Le Progrès Médical*, 1898, No. 18, p. 281.

MEDICINE.

UNDER THE CHARGE OF

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Cancer of the Œsophagus.—Huber has reported a case with some unusual features. The patient, a restaurateur, aged fifty-five years, began to complain of weakness and of piercing pain on swallowing. For years he had had attacks of an anginose character, frequently associated with hystero-epileptic paroxysms provoked by acute alcoholism. The patient was weak and emaciated, the pupils were contracted, and reacted to accommodation, but not to light. The reflexes were normal. Solid food could not be swallowed. On attempting to swallow milk, a coughing paroxysm was excited and most of the milk vomited. Examination of the pharynx showed a dilatation of the lower end, containing food-remains and mucus. The right vocal cord was

immobile, the left partly so. The œsophageal sound encountered an obstruction in the beginning, after passing which the rest of the œsophagus was traversed with ease. The first thought, that the case was one of cancer of the œsophagus growing into the larynx, seemed untenable, because of the impossibility of demonstrating a tumor by the usual methods of diagnosis. The suspicion of tabes dorsalis was entertained, and hysterical spasm of the œsophagus seemed probable. Applications of cocaine caused a diminution of the dysphagia. Examination with the œsophagoscope, however, showed thickening and redness at the level of the cricoid cartilage, without ulceration, infiltration, or constriction. Electrical treatment was followed by still further improvement of the local symptoms, but the progressing emaciation made the diagnosis of malignant disease most probable, notwithstanding. Laryngeal stenosis came on, followed by coma. Tracheotomy was made, but death ensued. Autopsy showed cancer of the œsophagus, growing into the muscles and cartilages of the larynx. Ulceration had been followed by phlegmonous inflammation of the larynx, without rupturing the mucous membrane of the latter.—*Berliner klin. Wochenschrift*, 1898, No. 24.

The Reserve Force of the Hypertrophied Heart, and the Significance of the Diastolic Expansibility of the Heart.—HASENFELD and ROMBERG have made extensive investigations which throw a great deal of light on many important problems in human pathology. Among the results the following may be cited: The degree of cardiac hypertrophy in valvular disease depends not on the duration, but on the extent of the insufficiency. In aortic insufficiency of slight or moderate degree, dilatation and hypertrophy of the left ventricle are the only consequences. If the lesion is more severe, the insufficient dilatation of the left ventricle causes increased pressure in the left auricle, with hypertrophy of that and of the right ventricle. The total strength of the heart is thereby increased. The organ compensates for the valvular lesion, and has, in addition, the same reserve force as a normal heart. However, this reserve force cannot be used to the proper effect, on account of the poor expansibility, the insufficient diastolic adaptability of the left ventricle. In aortic insufficiency the arteries undergo anatomical alterations in proportion to the extent of the vulvular lesion, their elasticity being lessened. This involves corresponding loss of function.

Intermittent Argyll-Robertson Pupil in Tabes Dorsalis.—EICHHORST (*Deutsche med. Wochenschrift*, 1898, No. 23) publishes two examples of this. Its rarity is shown by the fact that it is hardly mentioned by writers, and the author himself saw no other example in 103 cases long observed in his clinic. Both patients were women, thirty-eight years of age. In both cases there were evidences of syphilis, and the symptoms of tabes were plain. The pupil reflexes varied under continued observation and notwithstanding steady progress of the disease.

Ascarides in the Bile-ducts.—MERTENS (*Deutsche med. Wochenschrift*, 1898, No. 23) reports an interesting case in which the diagnosis was made during life. A woman, aged thirty years, who had had two attacks of biliary colic, was seized with colicky pain in the right side, with bilious vomiting, followed

in a week by jaundice. On admission to the hospital the gall-bladder could be made out by percussion; it was not sensitive. The liver and spleen were enlarged. The symptoms grew worse; pleurisy, with effusion, developed on the right side; later, ascites and œdema of the legs appeared. The jaundice was intense, the stools thin, with very little bile pigment and much free fat. Seven weeks after the beginning, after all the symptoms mentioned had become more pronounced, two ascarides were found in the stools. Both were macerated, and one of them showed a constriction about its middle. From that time the symptoms rapidly improved, though convalescence was delayed by a double suppurative parotitis. The author discusses the case with reference to the literature. In his own case he thinks the entrance of the worm into the duct was assisted by dilatation of the common duct from the previous passage of gallstones. Out of forty-eight cases of round-worm in the bile-ducts, there was a history of gallstone in only five. The present case is the only one followed by recovery, if we exclude the one of Dunkel, in which a round-worm was found in the pus of an operated liver-abscess. Besides these, only one other case is reported in which a diagnosis was made during life. In this, a five-year-old girl, with jaundice, pain, enlargement of the liver, and repeated chills, round-worms were vomited and passed with the stools. Death occurred from multiple liver-abscesses, the relation of which with the ascarides was made clear by finding dilatation of the duct post mortem. Mertens adds the history of a case in which ascarides wandered into the hepatic duct post mortem.

The Diagnosis of Œsophago-tracheal Fistula.—KOHLENBERG (*Deutsche med. Wochenschrift*, 1898, No. 23) had an opportunity of demonstrating on a case a method of diagnosis suggested by experiments of Gerhardt and others. An ordinary stomach-tube is introduced into the œsophagus, the uper window of the tube directed forward. The tube is passed down with short interruptions, while the patient makes deep inspirations and a lighted candle is held at the end of the tube. Under ordinary conditions the flame is blown gently in and out, but if there is a communication between the trachea and œsophagus the flame will be blown out when the opening of the tube comes opposite to the fistula.

Lymphadenoma and Rickets in a Child of Eighteen Months, Simulating Leukæmia.—H. D. ROLLESTON and A. C. LATHAM have observed a case of this kind, but, as the child was in the hospital only two days before death, it was impossible to make the examination as complete as could be wished. The child had granulation polypi in the ears, and began to be pale and weak after an operation on one of these two months before death. It was said the child "brought up blood," and, a week before death, petechiæ appeared in the skin. The spleen was enlarged; there was a painful swelling on the right side of the neck. Death followed from asthenia. Cover-glass preparations of blood taken before death showed degeneration of the red cells and increase of leucocytes. A differential count of the latter gave lymphocytes, 61.1; polynuclear, 16.5; eosinophile, 1.6; myelocytes, 20.8 per cent. While counting 500 leucocytes, 94 normoblasts and 6 megaloblasts were noticed; many of them showed mitosis. There were no Charcot's crystals. The au-

topsy showed marked anæmia, rickets, enlarged glands in the neck, normal sternum, but excess of lymphocytes in the rickety parts and shafts of the ribs. The stomach had a number of polypoid growths scattered all over the mucosa, except for an inch or more around the pylorus. The growths were soft, white, not ulcerated, and reached the size of a small walnut, being larger near the cardia. The lower Peyer's patches were enlarged and eroded. The spleen was much enlarged, the pulp "inundated" with lymphocytes. The kidneys contained small lymphomatous growths, as did the liver, which, microscopically, resembled that in leukæmia. The authors discuss the case in an interesting way, concluding that it was one of lymphadenoma complicated by or induced by rickets. Under the circumstances, this is, perhaps, all that the data permit; but as the history, like that in some other cases of so-called lymphadenoma, suggests infection, it seems strange this was not considered.—*The Lancet*, May 14, 1898.

The Hæmolytic Properties of Bothriocephalus.—SCHAUMANN and TALLQVIST (*Deutsche med. Wochenschrift*, 1898, No. 20) published some observations that help explain the severe anæmia sometimes associated with the broad tapeworm. Schapiro first suggested that the parasite produced a poison which, absorbed by the blood, caused increased breakdown of the red blood-corpuscles, but, although Vlajeff attempted to isolate the poison by chemical methods, no positive facts have previously been available. The authors experimented on dogs, first by using worms from individuals with bothriocephalus anæmia, and, finding these successful, used parasites from patients without anæmia. The worms were administered either partly digested by trypsin, or rubbed up with salt solution, or merely chopped up. Filtered extracts were also injected subcutaneously with similar effect, without producing local irritation. By all the methods the results were practically the same. After the first dose a loss of corpuscles of from one to one and a half millions was observed. Later the reaction was less marked or absent, or there was even an increase of corpuscles and hæmoglobin. The fall in the hæmoglobin was not so great as that of the corpuscles. The relative decrease of red corpuscles was not so severe as that in the tapeworm anæmia in man, probably because lack of material prevented the experiments from being carried on a long time. There were general symptoms referable to anæmia Post mortem, the bone-marrow was dark brownish-red; the liver and spleen gave a marked iron reaction. Rabbits seemed refractroy to extract of the parasites, and their blood, unlike that of dogs, was not made lake-colored by contact with it. Control-experiments showed that neither intestinal bacteria nor male-fern extract accidentally taken with the worms had anything to do with the anæmia. The worm-extract was shown to vary in its globulicidal effect in the test-glass. This, and perhaps other as yet unknown factors, accounts for the small proportion of persons who develop anæmia while infected with broad tapeworm.

Dilatation of the Antrum Pylori and its Relation to Motor Insufficiency of the Stomach.—MICHAELIS has investigated this subject by distending the stomach with air, marking out the boundaries, especially by the aid of percussion, and tabulating the results. In this way he found that if the motor

power is seriously disturbed the right margin of the stomach extends further to the right than in stomachs with good motor power. With very rare exceptions, if the right margin is more than 9 or 10 cm. from the median line, the motor power is more or less defective. In all the cases examined the extension to the right was due to actual enlargement, and not to dislocation to the right, a possibility the author does not deny. There are cases of motor insufficiency, with very slight enlargement of the stomach downward, but extending far to the right, and cases with good motor power, but enlargement downward. These facts indicate that the lateral enlargement is to a certain extent independent of other alterations in the size of the stomach, and is in close relation with the motor power of the stomach. Michaelis ascribes the enlargement toward the right to a dilatation of the antrum of the pylorus. The peculiar anatomical and functional features of this part of the stomach make it clear that an enlargement of the stomach to the right should excite suspicion of a motor disturbance, the positive determination of which must be made out by functional tests.

Meningococcus Intracellularis in the Nasal Secretions of Healthy People.—The work of numerous observers made it appear that Weichselbaum's coccus occurs in the nasal secretions only in persons with meningitis. At all events, the exceptions were so rare that the finding of the germs in the nares seemed to have a certain diagnostic value. SCHIFF, however (*Centralblatt für inn. Med.*, 1898, No. 22), has made some observations which compel us to revise that opinion. He had a patient who was suddenly taken with symptoms of meningitis. The suspicion that the case was one of epidemic meningitis was strengthened by finding in the nasal secretions large numbers of diplococci having all the characteristics of the meningococcus. Lumbar puncture, however, showed the presence of tubercle bacilli and the absence of cocci, and the diagnosis of tubercular meningitis was soon confirmed by autopsy.

This experience led Schiff to examine the nasal secretions in twenty-seven patients with various chronic diseases. All had either normal conditions in the nose, or, at most, mild chronic catarrh. In seven of these meningococci were found, but in only three in large numbers, permitting culture. It seems probable, therefore, that the parasites occur often without producing severe infection, so that an individual or local disposition (solution of continuity, for example) must be supposed. This fact helps to explain the cases, not rarely observed, in which meningitis has followed injuries of the skull.

The author found in the course of his investigations that the reaction of the cocci to Gram's stain was variable, thus explaining the contradictory statements of previous observers. He also, like Kiefer (AMERICAN JOURNAL OF THE MEDICAL SCIENCES, October, 1896, p. 478), acquired a mild rhinitis, with the specific germs in the secretions, while carrying on his cultures.

SURGERY.

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Fracture of the Calcaneum.—TUFFIER and DESFOSSES (*La Presse Méd.*, April 13, 1898) report an interesting case of fracture of the calcaneum, in which by means of the x-rays they were enabled to see the mechanism of the fracture, which formerly a post-mortem examination was alone capable of showing.

The skiagraph shows that a triangular portion of the calcaneum, which contained the attachment of the tendo-Achilles, was torn away, evidently by muscular force applied to it through that tendon. The skiagraph also shows that the line of fracture corresponded to the lines of the structure of the bone, and that the break started at the point where the force was applied to the longitudinal fibres of the bone.

The Treatment of Anchylosis of the Jaw.—ROSER (*Cent. f. Chir.*, 1898, No. 5) reports a successful case in which he employed a method which he devised for the prevention of a recurrent anchylosis. After an excision of the articular surfaces of the lower jaw he interposed a thin sheet of gold moulded to fit the joint in a measure, and thus, while helping to hold the parts in position, it prevented the formation of a bony or fibrous union.

The method of interposing portions of muscular structures has been employed by others, but the use of metal for this purpose, the author believes, has distinct advantages. The result in this case was eminently successful, the patient retaining the original amount of motion attained.

The author believes this method of interposing a foreign substance may be readily applied to other joints in the production of artificial arthroses.

Transperitoneal Nephrectomy with Marsupialization of the Peritoneum.—In all cases where the increased size of the kidney makes it apparent that it will be impossible to remove it by the lumbar route, VILLARD (*Gaz. Heb. de Méd. et de Chir.*, February 6, 1898) advises the employment of the transperitoneal route, with the previous performance of marsupialization of the peritoneum in the following manner:

The abdominal incision is made over the external border of the rectus muscle, making it possible to avoid the colon and pass externally to it in reaching the kidney. The length of the incision depends on the size of the tumors.

As soon as the peritoneum is incised hæmostatic forceps are placed upon the serous margins, everting them. This wound has presenting in it the anterior surface of the kidney, which is incised about an inch exterior to the insertion of the colon, which in the decortication is displaced internally. The two margins of the incision in the peritoneum of the kidney are caught with hæmostats and dissected up slightly and united to the peritoneum of the parietes on either side along the entire margin of the abdominal incision. There has thus been formed an opening through the abdominal wall down to the kidney, with the peritoneal cavity entirely shut off from the wound. Through this opening the kidney can be readily removed without danger of infection.

In cases of malignant tumors of the kidney the nephrectomy should be extracapsular; in cases of suppuration try the same process, but remember that more frequently it will be necessary to do a subcapsular nephrectomy.

The Disinfection of the Field of Operation.—Numerous methods have been employed with varying success for the disinfection of the skin in the field of operation; it is known that the bacteria are held in the natural fats of the skin and that their removal is essential to the destruction of the germs. LANDERER and KRÄMER (*Cent. f. Chir.*, 1898, No. 8) find that methods heretofore employed are none of them entirely satisfactory, since in a large percentage of cases treated by any of these methods bacterial colonies are found in large numbers. These bacteria are also found in the glands of the skin as well as upon the surface, and a method to be successful must penetrate deep into the skin.

They propose the employment of a 1 per cent. formalin solution for this purpose, and their experiments show that 80 to 90 per cent. of the cases are absolutely sterile.

The technique of the method is simple: After an ordinary soap-and-water bath, a compress wrung out of 1 per cent. formalin solution is placed over the part protected by a water-proof covering and held in place by a moist bandage. The action commences at the end of six hours. The bandage is continued on an average of from twelve to thirty-six hours, and is renewed once or twice during that time. If it is allowed to remain more than two days the skin is hardened and primary union interfered with. The ordinary means of sterilization are employed just before the operation.

Three Cases of Nephrectomy for Pyelonephritis Followed by Recovery.—COELHO (*Rev. de Chir.*, November 10, 1897) reports three cases of pyelonephritis in which the kidneys were so involved by the disease that nephrectomy was the only method of treatment that held out any chance of recovery.

The author does not believe that it will occur very often that three cases of pyelonephritis will be found that can be justifiably treated by nephrectomy. Many cases can be treated by medical means, and the great majority can be cured and leave behind, after a nephrotomy, sufficient functional ability in the kidney to be of great service.

The author does not believe that the good results which he has had in these three cases, the only ones he has operated upon, in any manner affect the

statistics or the gravity of this method of intervention, and says that he himself realizes more fully since these cases the gravity of the operation.

All three patients were between thirty and forty years of age; in all the pyelonephritis was of long standing; there was much difficulty encountered in each operation from the adhesions and connective tissues formed about the kidney and binding it down. The secretion of urine gradually increased in all the cases after the first twenty-four hours. The recovery was uneventful, with no fistula in any case. In all the cases the kidney was the seat of multiple individual abscesses of which, in instances, one or two communicated. There was, however, no microscopical secreting kidney structure remaining, the tissue being connective and adipose.

The Mechano-therapy of Movable Kidney.—ECCLES (*The Lancet*, January 29, 1898) says, of twenty-one cases treated by abdominal massage, exercise, rest, and an abdominal pad and belt, that the results obtained are for the most part so satisfactory that they bear favorable comparison with records of those treated by operation. Early diagnosis, reposition, and the maintenance of the organ in position by methods which also conduce to the improvement of the general health, would appear to go far toward the relief of the patient from the necessity of having the kidney stitched into its place or removed from the body. These cases should at least be subjected to this form of treatment before operation is determined upon; the time required is not wasted, as the patient is all the time gaining strength, and is in better condition for operation if it becomes necessary.

The author reports in detail seven cases, of which he says that in all there were physical signs, local and general symptoms which are attributable to the dislocation and mobility of the right kidney, and the results show that much suffering and chronic illness can be averted by means entailing none of the risks possibly incurred by operation.

In these cases of floating or movable kidney, no less than in other forms of enteroptosis with so-called functional disorder of digestion, the indications are to restore healthy tone and to induce the redeposition of fat and flesh to the abdominal walls, as well as to improve the nutrition of the viscera and replace the packing material of fat, which in many cases has vanished. This, he believes, is best secured by a rest-treatment, carefully regulated diet, exercise in increasing amount, while precautionary measures are taken to replace the kidney and keep it in proper position.

The Immediate Correction of Angular Deformity of the Spine.—CLARKE (*British Medical Journal*, February 12, 1898) was induced to try this method of treatment by the fact that after what was apparently a perfect cure by means of splints, and the spine was firm and free from tenderness, the slight curve that remained would gradually increase.

In a favorable case in a child, two and one-half years old, he performed forcible extension, straightened the spine, and applied a plaster jacket strengthened by iron bands. At the end of six weeks the plaster had to be removed, and it was found that most of the deformity had returned. The spine was again straightened and a plaster and metal apparatus so arranged that the spine was over-extended and extension could be applied to

the armpits and lower limbs. The patient was perfectly comfortable in this position for a month, when the spine was again examined. The deformity was certainly diminished, but not removed. The part was now free from tenderness, and on giving an anæsthetic it was found that there was now more resistance, pointing to some bony ankylosis having taken place, so the deformity was not corrected. The patient was replaced in the apparatus. A fortnight later a Chance's splint, with an occipital head support, was applied. Three and three-quarter months after the first operation the child could sit up without discomfort and without fatigue.

The author prefers the Chance's splint to Thomas's splint. The author's experience leads him to await the results of others before applying this method in his own cases further.

Trephining the Skull.—The various means now in vogue for trephining and the different processes by which large bone and skin flaps are raised in modern operations on brain tumors, are discussed at length by BRAATZ (*Cent. f. Chir.*, 1898, No. 3). He believes that the best method is by the use of Gigli's wire saw, which is passed between the dura mater and the bone, through small trephine openings or drill holes, which are placed at convenient intervals in the line of the flap which is to be removed.

The perforations through the skull, he believes, can be more readily made by employing a simple mechanical drill which he has devised for this purpose, than by the use of trephines or ordinary drills.

The use of the Gigli saw has the advantage of destroying only a small amount of bone substance, so that if it is desired the bone flap can be replaced. By making the cuts slightly bevelled the bone is prevented from pressing on the brain, while thin bone periosteal flaps may be made that will lap over the cut-out point, and thus securely close it.

A Case of Fatal Acute Dilatation of the Stomach Following Cholecystotomy.—FENGER (*The Clinical Review*, February, 1898) reports a case under the above title, from which he draws the following conclusions:

1. During the course of convalescence from some acute or chronic disease, the stomach may undergo rapid dilatation.

2. This condition is marked clinically by a sudden and violent onset; vomiting is violent and intractable: large quantities of fluid are ejected; the fluid is usually greenish, due to admixture of bile. The patient is reduced to a state of collapse or exhaustion, which may prove fatal in a few days.

3. During the progress of the disease the abdomen becomes distended, the right hypochondrium remaining flatter. The bowels move spontaneously, and a splashing sensation may be elicited over the site of the distention. Sensorium usually cloudy.

4. If treatment is unsuccessful the abdomen becomes more distended, vomiting ceases, and the patient dies of exhaustion.

5. Indications for treatment are:

(*a*) Supportive measures.

(*b*) Use of stomach-tube one or more times daily, as early in the case as possible.

(*c*) Rectal feeding.

(*d*) No food by the mouth until vomiting is nearly or quite controlled.

6. The treatment without lavage is unavailable, and use of narcotics worse than useless.

Four Cases of Gastro-enterostomy for Pyloric Cancer.—BARKER (*The British Medical Journal*, February 12, 1898) reports four cases in which operation was delayed too long to make recovery possible. The first died of shock, the second of inanition, perhaps aggravated a little by shock. The two last cases recovered thoroughly from the operation, the parts uniting perfectly, and leaving nothing to be desired as regards the function of the new openings. The third case was complicated by a stomach injured by dilatation and putrescence of food with bacterial fermentation. It was the seat of ulcers, one of which perforated an artery, causing fatal hemorrhage. In the last case, although the relief of symptoms after operation was most marked, the cancerous ulcer was too far gone in destructive change, and opened into the peritoneum just when we hoped the patient would be able to leave the hospital. The author operated upon two cases previous to these. One lived for a year and a week, and grew fat and strong enough to resume domestic duties, dying ultimately of generalization of the carcinoma. The second left the hospital improved and walking about. Some time after he died of a pneumonia. A post-mortem examination of the stomach showed a perfect union with the proper spot in the jejunum.

Of the six cases, two died directly after the operation. In the four others the operation was successful, but too long delayed to prove beneficial in two of them, as perforation followed.

The author prefers the use of the simple suture with fine silk to any other contrivance, and says he has then no fear of buttons falling into the stomach or becoming jammed in the intestine.

The Influence of the X-ray Method of Diagnosis upon the Treatment of Fractures.—In remarking on the benefits which this new method of diagnosis has conferred upon the treatment of fractures, LEONARD (*Therapeutic Gazette*, March, 1898) says: "It cannot be expected of any new method of diagnosis that it will replace or at first even equal methods which have attained accuracy and scientific precision by the study of generations of observers, and yet this new method of diagnosis has already produced results which markedly affect the treatment of certain forms of fractures."

The greatest value is in the determination of the exact nature of injuries and the point where danger is to be expected from exuberant callus, or the blocking of the joint by overlapping of the fragments. In many instances fractures that lie wholly within the capsule of the joint, and thus escape detection, are distinctly shown and are rendered amenable to treatment other than that for "bad sprains."

"Many fractures which have been described as rare have been shown by this method to have been rarely detected, while the exact determination of the form of fracture and the recognition of minute comminuted fragments have rendered coaptation more precise and the result of treatment more perfect."

One of the greatest influences of this method upon the treatment of frac-

tures is the change it is bringing about in prognosis. Antisepsis has robbed the compound fracture of its gravity, and the skiagraph has shown that in many cases the simple fracture is much more dangerous and liable to be followed by greater deformity and loss of function, and that its name is often a misnomer. The author advocates the change suggested by others, of the terms open and closed for simple and compound; and advises in many instances the treatment of simple fractures by open operation, claiming that under aseptic precautions there is no danger commensurate with the advantages gained.

Of the medico-legal value of the skiagraph he says: "There seems to be no doubt that the only ground for damages in suits for malpractice must be, as formerly, based upon expert testimony as to the amount of deformity and functional disability of the patient. . . . There is, however, reasonable ground for holding that unless a skiagraphic examination of the fracture has been made, or at least suggested by the practitioner and declined by the patient, it cannot hereafter be said that where functional disability exists the practitioner has employed all reasonable and ordinary means, to the best of his ability, in the treatment of the fracture."

OTOLOGY.

UNDER THE CHARGE OF

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Treatment of Chronic Purulent Otitis Media.—In speaking of the treatment of chronic suppurative ear-disease, R.H. WOODS (*Dublin Journal of Medical Science*, January, 1898) says it is the rule, rather than the exception, at least among the poor, to hear a mother excuse the neglect of her child's incurable ear by saying "she thought it would grow out of it," or "she was told it would be dangerous to stop the discharge." "I regret to say the doctor is often quoted as having originated or confirmed this view. That qualified men are to be found capable of committing themselves to statements such as these is a satire on examinations. Ignorance such as this can be combated only by the education of the profession and the enlightenment of the pulbic."

MÜLLER (*International Medical Magazine*, December, 1897, p. 759) reports two cases of chronic purulent otitis media treated with *Koch's Tuberculin R.* One case was made worse by the treatment, apparently, and the other was not benefited by it.

Thorough cleansing, with antiseptics first, and then, if this is unavailing, removal of the membrana tympani, malleus, and incus, to improve drainage, is approved of by A. H. BUCK (*British Medical Journal*, November 27, 1897), MACCUEN SMITH (*Cinn. Lancet-Clin.*, July 24, 1897), E. B. DENCH (*Medical News*, July 3, 1897), C. H. BURNETT (*Internat. Med. Mag.*, December, 1897, and *Philadelphia Medical Journal*, February 26, 1898), and J. H. STUCKY (*Journal American Medical Association*, March 26, 1898).

Regarding this most important subject, N. H. PIERCE (*Journal American Medical Association*, January 1, 1898) states that he has "come to believe from experience that many cases of catarrhal inflammation assume a suppurative or chronic form because of ill-advised treatment. One of the most prevalent errors in this regard is the empiric and illogic use of ear-drops, douches, and inflations."

[The prime consideration in treatment of any form of otorrhœa, whether acute or chronic, is the promotion of drainage. In order to do this it is not necessary to do much in the way of local treatment, which, too often irritates, blocks the opening in the drum membrane, and thus interferes with drainage. The case is thus artificially thrown into a condition demanding treatment, especially if an *artificial* mastoiditis is set up, as is too often the result. We have yet to see, after twenty-five years' experience, an acute mastoiditis consecutive to an acute otitis media, in a previously healthy ear, that was not the direct result of *artificial* secondary infection.]

Illustrations of the evil results of neglected middle-ear suppuration, especially in children, are given by E. B. DENCH (*American Gynecological and Obstetrical Journal*, October, 1897).

Indications for Operation on the Mastoid and Tympanic Antrum.—RICHARD LAKE (*Medical Press and Circular*, January 19, 1898) gives the following indications for operation upon the mastoid and tympanic antrum: (*a*) 1. Acute otitis media suppurativa, with acute disease of the antrum. 2. Influenzal mastoiditis. 3. Secondary infection from meatal abscess. 4. Acute tuberculosis of the middle ear. (*b*) 5. Chronic otitis media suppurativa. 6. Acute exacerbation in chronic disease. 7. Periodic or constantly recurring discharge. 8. Facial palsy (in chronic cases, rare in acute). 9. Cholesteatomata of attic and antrum. 10. Vertigo on syringing. [Vertigo, when of a rotary and horizontal character, is considered by Lake a symptom "that the membranous external horizontal semicircular canal is exposed through caries of its bony wall."] 11. Persistent mastoid pain. 12. Contraction of the meatus. 13. Bezold's mastoiditis [with perforation of the medial plate, generally into the digastric fossa]. 14. Mastoid fistula. 15. Necrosis. (*c*) 16. As a preliminary to other operation. Lake also appends "a simple record of the means best calculated to avoid operation, as follows: 1. Incision of the membrane. 2. Boric fomentations. 3. Antiseptic irrigations of the meatus. 4. Leeches to the mastoid. 5. Leiter's coil, or external cold. Above all, avoid all blisters; they mask the symptoms, and give rise to false impressions, for pain is of necessity bound to be felt when one presses on a blistered surface, especially if, as here, over bone."

Chronic Mastoid Abscess, of three years' duration, in a child, aged five years, is reported by G. C. STOUT (*Philadelphia Polyclinic*, July 31, 1897) as cured promptly by removal of a large sequestrum through an incision over the mastoid.

That acute and chronic caries and necrosis of the mastoid, with their sequelæ of pachymeningitis externa and epidural abscess, are entirely relievable by prompt and thorough surgical intervention is shown by nine cases

operated upon and reported by H. KNAPP (*Journal American Medical Association*, March 19, 1898).

J. E. SHEPPARD (*Brooklyn Medical Journal*, July, 1897) has observed twelve cases of mastoiditis without or with but little involvement of the tympanic cavity, and MACCUEN SMITH (*Therapeutic Gazette*, August, 1897) also reports the observation of mastoid empyema without the usual objective symptoms.

That very often, in marked *external* symptoms of acute mastoiditis, mastoid trepanation is not finally demanded, is shown by cases reported by ADA AUDENRIED (*Philadelphia Polyclinic*, Nov. 6, 1897) and F. S. PARSONS (*Medical Times and Register*, March 12, 1898). Also that in many instances in which the symptoms are supposed to indicate mastoid trepanation, and even cranial-mastoid trepanation, for the relief of a supposed otitic lesion of the brain, all these symptoms will subside and the patient recover without operation, is shown by cases reported by H. WOODS (*Journal American Medical Association*, March 19, 1898).

After-treatment of the Exposed Middle-ear Cavities.—E. WINCKLER (*Münchener med. Wochenschrift*, Nov. 30, 1897), in discussing the various ways of bringing about the formation of normal epidermis in the wound cavity produced by the surgical exposure of the middle-ear cavities, believes that the impartial judge will decide that "just as the extent of the operation in every instance must be determined by the nature of the symptoms, so, too, must the after-treatment be instituted according to the extent and conditions of the wound produced."

Otogenous Abscess in the Right Temporal Lobe of the Brain.—Small abscesses in the temporal lobes, and abscesses in the right temporal lobe, may run their course without central symptoms, as shown by OPPENHEIM (*Nothnagel, Spec. Path. u. Therap.*, 1897). Optic acoustic aphasia is the usual symptom of abscess in the left temporal lobe. The same symptom may be present with an abscess in the right temporal lobe of a *left-handed* subject. However, the diagnosis of an abscess of the right temporal lobe is far more difficult than that of the left, since the physician must be guided by the existence or discovery of symptoms that are termed indirect, or symptoms of contiguity, as shown by E. KALMUS (*Prager med. Woch.*, December 23 and 30, 1897), in reporting a case in the practice of Prof. Pica. In such a case there must be considered the not uncommonly observed hemianopsia, various phenomena of motor paralysis, and irritation, as facial and facio-brachial paresis, hemiparesis, hemiplegia, and spasms of one side of the body. Kalmus further shows that in such a case is found conjugate deviation of the head and eyes, as pointed out by Jansen, Oppenheim, H. Jackson, Zaufal, and Pick. Rarer manifestations are disturbances in sensibility. Partial and complete oculomotor and abducens paralyses are sometimes observed, as are also the rarer occurrences: nystagmus, singultus, photophobia, absence and increase of patellar reflex of the affected side, strangury, and involuntary urination and defecation, as shown by Körner. But all of these indirect symptoms may be absent or so unpronounced as to be easily overlooked. There may be, also, in addition to the above-named symptoms,

elevations of temperature, increased frequency of respiration, *relatively low pulse*, lagophthalmus on the opposite side, protrusion of the eyeball on the side of the abscess (right), with narrowing of its pupil. In Pick's case of otitic abscess of the right temporal lobe, in which there was ambilateral chronic otorrhœa, reported by KALMUS (*Münch. med. Woch*, December 23 and 30, 1897), the diagnosis of the locality of the abscess was based upon the paralysis of the left facial and hypoglossus nerves, the weakness of the left arm, the occasional spasmodic pronation and supination occurring in it, paresis of the left leg, lateral homonymous hemianopsia on the left side, conjugate deviation of the eyes and head toward the right. The intermission observed in these symptoms of paresis and hemianopsia during the week the patient was under observation in the hospital is ascribed to their being indirect central symptoms, since, had the lesion of the optic radiations been a direct one, the hemianopsia would have been permanent. The abscess-cavity, extending from the posterior two-thirds of the temporal lobe to the anterior part of the occipital lobe, measured 7 cm. in length and 3 cm. in its greatest diameter. There were destructive necrosis of the tegmen tympani, and purulent, ichorous infiltration of the bone near it in the tract of the large wing of the sphenoid, of the posterior part of the right frontal squama, and also of the anterior inferior angle of the right parietal bone. An operation was declined in this case. The diagnosis was established at the autopsy.

Paracentesis of the Membrana Tympani.—All aurists of experience will agree with J. GRUBER (*Medical Press and Circular*, January 5, 1898), that paracentesis of the membrana tympani is indicated "whenever any inflammatory products are satisfactorily diagnosticated to be present in the middle ear. For this purpose the knife is vastly preferable to the galvano-cautery, as the latter method produces a large destruction of the membrana, healing very slowly." The wide, semicircular incision around and posterior to the manubrium, with the minor adjuncts of suction in preference to compression (inflation) for the removal of fluid from the tympanum, are recommended by Gruber. He further maintains that "great prudence should be exercised in the use of the air douche (inflation), as any infectious matter may be driven back into the mastoid cells, where a new source of trouble will start, leading on to mastoiditis and, probably, terminating with serious consequences."

The objections to paracentesis in ordinary acute otitis media urged by R. H. WOODS (*Dublin Journal Medical Science*, January, 1898) are founded on the observation of a large number of cases of what he terms "acute otitis media without pain."

[Cases answering to this description must have been instances of myringo-dermatitis, or myringitis, rather than otitis media, such as have been described by J. E. SHEPPARD and C. H. BURNETT (*Year-book of Medicine and Surgery*, 1898) and by R. W. SEISS (*Journal American Medical Association*, March 19, 1898). In any case of accumulation of fluid in the drum-cavity, especially if pain or dulness of hearing, or both, are present, prompt paracentesis is indicated. If the fluid in the drum-cavity is not thus let out, it may organize and lead to synechiæ. If myringo-dermatitis occurs,

and if a bleb forms on the membrana, the former may be punctured if pain is great; otherwise it may be let alone, and spontaneous rupture or absorption awaited. In puncturing a bulla or a bleb of the membrana, care must be taken not to puncture the inner wall of the sac, for if this inner wall is punctured the infectious contents will pass into the drum-cavity and inoculate it.—ED.]

DERMATOLOGY.

UNDER THE CHARGE OF

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Treatment of Epithelioma by Arsenical Solution.—BORDE (*Annales de Dermatologie et de Syphiligraphie*, 1898, No. 2), at a meeting of the Société de Médecine et de Chirnrgie de Bordeaux, reported a case of epithelioma, in which a recurrence had taken place after surgical interference, treated by painting the point of implantation of the tumor with Czerny's solution of arsenic. These applications were made every two days, and in a short time a cure had taken place.

DAVEZAC presented to the same society a patient, aged eighty-three years, who had had an epithelioma of the nose for about one year, in whom recurrence had taken place after thorough treatment with the thermo-cautery. A cure was obtained by the application of Czerny's solution.

Ulcerations Due to the Bacillus Pyocyaneus.—TRIBOULET and TOLLEMER (*Annales de Dermatologie et de Syphiligraphie*, 1898, No. 2) reported at a séance of the Société Anatomique de Paris a case of an infant, aged ten months, which suffered from disseminated, cup-shaped and round ulcerations. Cultures prepared from these lesions revealed the presence of the bacillus pyocyaneus. At the autopsy, blood from the heart was found to contain the same organism. Sections of the skin showed that the bacilli were present only in the superficial layers of the derma, the capillaries being free from them. From these facts it would seem that the cutaneous ulcerations were the port of entry for the bacillis which caused the septicæmia.

A Case of Monilethrix with Unusual Distribution.—GILCHRIST (*Journal of Cutaneous and Genito-Urinary Diseases*, April, 1898) reports the following case: A young man, aged twenty-eight years, first noticed at the age of seventeen two symmetrical bald patches on the anterior surface of the legs. There were no subjective symptoms. These two patches gradually increased in size, and were followed by other symmetrical patches on the thighs and calves about two years after the first appearance of the affection. Microscopic ex-

amination of the diseased hairs revealed a well-marked nodular appearance. Sections of the skin taken from the margin of a bald area showed the following changes: The epidermis was thinner than normal, and the follicles presented marked alterations, the mouths being the seat of a hyperkeratosis. In the corium were numerous connective-tissue and lymphoid cells. Culture experiments failed to reveal any organism. The author's conclusions concerning the malady are as follows: Clinically, pathologically, and bacteriologically it is distinct from trichorrhexis nodosa. It originates in the hair-follicle near to the papilla. The corium around the follicle is the seat of chronic pathological change. The hair-shaft is secondarily affected, and the follicular hyperkeratosis is likewise a secondary process. The disease is probably trophoneurotic in origin.

A Case of Keratosis Follicularis.—Bowen (*Annales de Dermatologie et de Syphiligraphie*, 1898, No. 1) reports a case of this disease limited to the head and hands. The patient was a woman, aged thirty-three years, whose family was free from cutaneous disease, except the mother, whose hands were said to resemble those of the patient. The skin of the face was thick, greasy, and of a brownish tint, especially marked on the temples and at the margin of the scalp. The face was the seat of a great number of small papules, some of which had a depression in the centre in which was a small fatty plug. The lesions were most marked behind the ears, where they were entirely characteristic, and were much larger than those upon the face. In some places the lesions were confluent, and behind the ears presented an irregular papillomatous aspect. The scalp was covered with fatty crusts and scales, differing from the crusts and scales of seborrhœa in that many of them were contained in depressions from which they could readily be removed. Upon the dorsal surface of the hands were numerous small, firm papules of the color of the normal skin, covered with a thick corneous layer which gave them a verrucous aspect. The remainder of the cutaneous surface was entirely free from disease. Examination of excised lesions showed appearances typical of keratosis follicularis. Prolonged employment of stimulating and keratolytic ointments produced marked amelioration of the disease.

The Best Form of Mercurial Inunction Cure.—Unna (*Monatshefte für prakt. Dermatologie*, January 15, 1898) calls attention to the fact that the use of "mercury-salve soaps" for the purpose of inunction is not new, as claimed by some, but has been employed by him uninterruptedly since 1884. The advantages of this form of inunction have been put forward in the work of Dr. Leistikow (*Therapie der Hautkrankheiten*, Hamburg, 1897), recently recorded in the Journal, based upon treatment with 4000 cases. Unna considers that this method is more agreeable and convenient to patients than that of mercurial ointment, and that from the physician's stand-point it acts energetically upon all varieties of syphilitic lesions, and more rapidly than mercurial ointment. Further, that mercurial ointment is rubbed in satisfactorily only in subjects with a markedly fatty skin, while the "mercurial-ointment soap" is well adapted to all conditions, acting more energetically and surer upon deep-seated local lesions than mercurial ointment, and that

it is particularly indicated in glandular swellings and bone affections. The "gray soap" (*sapo cinereus*) recommended contains, as in the case of all "ointment-soaps," a cooked potash solution and fat, with 5 per cent. benzoinated fat superadded to the body of the soap, with which is incorporated half its weight of quicksilver. For an active course of inunction about a drachm is used daily; for a mild course from fifteen to thirty grains. The application is allowed to remain on the skin about a week. It does not stain the linen appreciably.

Prophylaxis of Leprosy.—HANSEN, the noted leprologist (*Monatshefte für prakt. Dermatologie*, Bd. xxv., No. 9), concludes his article by stating that in all countries where leprosy is met with endemically, isolation has proved the most useful method of preventing the spread of the disease, and, in the light of Norway's experience, is to be commended. While the leprabacillus is the true cause of the disease, the conditions of life and the way in which the bacillus enters the body are unknown; but Hansen thinks it probable that the mouth and nasal cavities are the avenues of entrance. Leprosy is contagious, but not hereditary. The worse the social relations the greater is the danger from contagion. Up to the present time the disease has resisted all manner of treatment looking to a cure.

OBSTETRICS.

UNDER THE CHARGE OF

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Four Cases of Cæsarean Section for Osteomalacia.—In the *Monatsschrift f. Geburtshülfe und Gynäkologie*, Band vii., Heft 6, 1898, SIEBOURG reports four Cæsarean operations for osteomalacia. The first patient was twenty-six years old and had borne six children. During her third pregnancy she began to have pain in the legs and sacrum, and these symptoms became worse in subsequent pregnancies. She finally was unable to walk or stand and was very much reduced.

On examination the characteristic signs of the disease were present in the pelvis and very well marked. As the child's heart-sounds were strong and clear, it was determined to deliver the patient by Cæsarean section. This was done by amputating the uterus and stitching the stump at the lower end of the abdominal incision. The patient made a good recovery and became able to walk, and was entirely relieved of her pain. At the time of operation she suffered from a severe bronchial catarrh, which also disappeared.

The second patient was thirty-seven years old, and gave a history of having suffered for six years with osteomalacia. The patient had been three years

in bed. Characteristic signs and symptoms of the disease were very clearly present. The heart-sounds of the child were plain, and it was determined to perform Cæsarean section, and in addition to entirely remove the uterus. This was done in the usual manner, although difficulty was found in checking the bleeding because of the relaxed condition of the tissues in the broad ligaments. The patient had hemorrhage after the operation, and perished in collapse. Abdominal section showed a considerable amount of blood in the abdomen, which had apparently oozed from the stumps of the broad ligaments.

Case third, aged thirty-nine years, had borne four children without assistance. During the third pregnancy symptoms of osteomalacia appeared, and were aggravated during the fourth pregnancy. She suffered severe pain in the sacrum and legs, and the pelvis was greatly deformed. The child was removed by transverse incision across the fundus. The uterus was amputated and the stump stitched in the lower end of the abdominal incision. The patient made a good recovery from operation and her pain was relieved.

Case fourth was in her eighth pregnancy, having passed through seven normal labors. Five years previous she had noticed symptoms of osteomalacia, and these had steadily grown worse. As the patient was highly deformed, Cæsarean section was chosen and the uterus amputated and its stump fastened in the lower end of the abdominal incision. This patient made a good recovery and was relieved of her symptoms.

Siebourg considers total removal of the ovaries, tubes, and uterus to be the best operation in these cases. His good results with amputation and stitching the stump in the abdominal incision lead him to advise this in cases where for any reason total removal of the uterus cannot be performed.

Incarcerated Ovarian Dermoid Removed During Labor.—In the *Transactions of the Obstetrical Society of London*, vol. xl., Part I., SPENCER reports the case of a patient, aged twenty years, who had had one dead child previously without difficulty. With the second child the labor was obstructed by an ovarian dermoid, weighing sixteen ounces, incarcerated in the pelvis. As the tumor could not be pushed up, laparotomy was performed, the uterus withdrawn from the abdomen, the tumor removed, and the child delivered by forceps applied in the dorsal posture. Mother and child recovered.

In the treatment of ovarian tumor obstructing labor, Spencer would push the tumor out of the pelvis if possible. He discards version, forceps, craniotomy, and simple incision or tapping of the tumor, on account of the danger. Cæsarean section will very rarely be necessary if the tumor be withdrawn from the pelvis. Abdominal ovariotomy is the safer operation, and should be preferred to vaginal ovariotomy.

Spencer also reports a dermoid ovarian tumor which was incarcerated in the pelvis and obstructed labor. The tumor was pushed up out of the pelvis under chloroform, the child delivered by forceps, and ovariotomy performed seven months later.

Rupture of the Uterus During Unobstructed Labor.—In the *Transactions of the Obstetrical Society of London*, vol. xl., Part I., DAKIN reports the case of a woman in her eleventh labor, aged forty years, who had a normal pelvis and whose child was in the normal position. Former labors had been

normal. There was no history of acute disease, although the patient was not well nourished. The patient had slight sharp pains, followed by slight bleeding. The membranes ruptured and the os dilated completely. As the patient was pale and had a pulse of 100, she was delivered easily by forceps. The child was dead. Efforts were made to express the placenta, but were unsuccessful. The physician who introduced the hand found above the external os a rent on the right side and the placenta half-way through it. He extricated the placenta, and then severe collapse occurred, in which the patient died.

On autopsy, the abdomen was full of blood. The uterus was well contracted. The tear extended from a point a little above the internal os and three-quarters of an inch below the retraction ring to a point between the right tube and round ligament. The tear was at first almost horizontal, then oblique and then vertical. The placental site was torn through by the rupture.

A microscopical study of the muscle fibres showed them to be fatty and abnormally friable.

Two Cases of Cæsarean Section.—In the *Boston Medical and Surgical Journal*, June 2, 1898, WASHBURN reports two Cæsarean operations done in the homes of the patients. Both were successful. The houses were country tenements, and very limited conveniences for operation were at hand.

In the first case the true conjugate was a little over three inches. The patient had been in labor twenty-four hours, was thirty-eight years old, and this was her first pregnancy. The usual cœlio-hysterectomy was performed, the placenta and membranes were torn off rapidly, the uterus washed out with hot lysol solution, the washing being done through the cervix and vagina, and a strip of iodoform gauze was packed through the uterus and down into the vagina. The muscular portion of the uterus was sewed with a No. 3 catgut, the stitches about an inch apart. The serous layer was closed with continuous suture of small catgut. The abdomen was closed as usual and the usual dressing applied. The child weighed eleven pounds. Some portions of membrane were left in the uterus, and an intra-uterine douche was given, which brought them away. The patient was up and about in five weeks, and three months later was perfectly well. She got out of bed several times during the first ten days when the nurse was absent from the room.

In the second case high forceps had been tried unsuccessfully. The same method of procedure was followed with a very good result.

Exploratory Laparotomy in Vomiting of Pregnancy.—REYNOLDS (*Boston Medical and Surgical Journal*, June 2, 1898) reports a case of pernicious vomiting in which a pelvic enlargement complicated the condition. Without an anæsthetic the cervix was dilated sufficiently to permit the passage of a small curette. As a clear diagnosis could not be made in this manner, the patient was quickly etherized and the abdomen opened, when it was seen that the mass was a fibroid, the uterus pregnant at about three months. The abdomen was immediately closed, the cervix was then forcibly dilated, and a small ovum removed from the fundus above the fibroid. The patient instantly improved and subsequently made a good recovery.

The Bacteriology of the Vagina.—In the *Archiv f. Gynäkologie*, Band lv., Heft 3, 1898, KOTTMANN describes investigations to determine the presence or absence of bacteria in the vagina during pregnancy, and also the sort of germs which are there present.

He found that in women who had not been examined, bacilli of various sorts are present in the vaginal secretion. The staphylococci found in these cases are identical with those found in other conditions. The streptococci resemble exactly those seen in septic cases, differing only in virulence. They become deadly readily after labor. Kottmann found it impossible to separate vaginal secretion into normal and pathological. He believed that no prognosis regarding the patient's recovery could be formed from this factor alone. Germs found in the lower portion of the vagina are more virulent than those isolated from the upper part.

Repeated Ectopic Pregnancy and Operation in the Same Patient.—In the *Zeitschrift f. Geburtshülfe und Gynäkologie*, 1898, Band xxxviii., Heft 2, FALK reports the case of a woman, aged twenty-nine years, who seven years before had a normal labor followed by a normal recovery. After menstruation had ceased for two months, she had bleeding for six days, but passed no membrane. She complained of pain in the sacral region and weakness. On examination an elastic tumor was found behind the uterus, and a few days afterward the patient had a sudden attack of syncope. On abdominal section, pregnancy was found in the right tube, which was removed. The patient made a good recovery. Three years later she returned to the clinic in a very anæmic condition. There were dulness over the abdomen and a tumor behind the uterus, which was elastic.

The history was given that the patient had ceased menstruation for several months, and that while milking she was suddenly taken with collapse.

She took strong purgatives, which further reduced her strength. On opening the abdomen, the left tube was found pregnant and ruptured. Considerable blood had escaped behind the uterus. The tube and ovum were removed, the pelvis emptied and drained, and the patient made a good recovery.

GYNECOLOGY.

UNDER THE CHARGE OF

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OF NEW YORK.

Post-operative Pyschoses.—In a discussion on this subject before the Société de Chirurgie (*La Presse Médicale*, 1898, No. 28), REYNIER denies that psychical disturbances could result from surgical operations in patients without any previous tendency to such manifestations. A careful review of the family history of such individuals will show that there is either a marked hereditary taint, or that they have already presented evidences of some mental or moral aberration.

SEGOND affirmed that he was unable to offer a satisfactory explanation of the psychoses following gynecological operations. He was inclined to believe that suggestion was an important factor in many instances. Among 642 cases of artificial climacteric he was able to find, after a conscientious search, only four patients with post-operative mental affections—one of kleptomania, two of melancholia, and one of mania. The latter persisted for only two weeks, and the two cases of melancholia made a rapid recovery. The patient with kleptomania "was a thief before operation, and remained one afterward."

The speaker summarized his views as follows: There is no recorded case of a psychosis directly due to a surgical operation. In the great majority of the cases in which mental disturbances have been attributed to surgical interference the patients were either mentally affected beforehand, or possessed an hereditary taint. In the absence of a previous history, women who become insane after operations should be regarded as the victims of suggestions, furnished by either the physician or friends of the patient.

[These opinions are so much at variance with those usually expressed by writers on this subject that they deserve careful consideration, especially in view of the weighty authority of Segond. So many loose statements have been made with regard to the frequency of psychoses following gynecological operations, that it is evident that this question needs thorough revision. The theory that suggestion has much to do with the psychical disturbances observed in women after removal of the ovaries has a strong air of probability, considering the views prevalent among the laity, which have received general support from the profession, often on a purely sentimental basis.—H. C. C.]

Plastic Operation for Incontinence of Urine.—LEBEDEFF (*Wratch; La Gynécologie*, 1897, No. 6) reports the case of a patient who was unable to retain her urine after an operation for urethro-vesico-vaginal fistula. In order to replace the sphincter action which was wanting he devised the following method of making pressure upon the posterior wall of the urethra. A surface an inch long and half an inch wide was denuded on either side of the urethra, in the folds between it and the labia minora. The posterior wall of the urethra was then pushed upward so that the surfaces could be apposed, and their inner edges were united by a continuous catgut suture. Silk sutures were used to complete the approximation. On filling the bladder with water and exercising pressure upon it, its retentive power was found to be perfect.

Surgical Treatment of Retroversion.—DOLÉRIS (*Ibid.*) concludes an elaborate paper on this subject by emphasizing the unsatisfactory results often obtained in the treatment of retroversion by plastic operations on the cervix uteri and vagina. Moreover, even when these operations have been supplemented by shortening of the round ligaments, hysteropexy, etc., errors in technique or subsequent accidents have allowed the uterus to return to its abnormal position.

The writer denies that retroversion in itself is not a disease. It is the result of a complex disturbance of the pelvic equilibrium, of which it is, however, usually only an epiphenomenon. None the less, treatment should be

directed toward the deviation. When the symptoms persist after the introduction of a pessary or after operative interference, it is usually because there is a return of the displacement. He is opposed to the use of a pessary after performing plastic operations on the cervix and vagina, since the patient might be cured by shortening the round ligaments or hysteropexy. It is assumed that uncomplicated retroversions are considered; in the presence of salpingo-oöphoritis, the latter is necessarily a side issue.

Kustner's Incision in Cœliotomy.—FRANTZEN (*Gaz. de Botkine; La Gynécologie*, 1897, No. 6) describes the following modification of Küstner's incision in ventro-fixation: A transverse cut is made through the skin, its edges are held apart with retractors, and the peritoneal cavity is then opened by a longitudinal incision. Two sutures are passed through the fundus uteri and include the peritoneum, aponeurosis, and lower skin flap. Deep sutures are inserted, and finally the edges of the external wound are approximated, and the sutures including the uterus are tied over a roll of gauze. The resulting cicatrix is said to quite firm.

General Gonococcus Infection.—RENDU and HALLÉ (*Sem. Gyn.; La Gynécologie*, April 15, 1898) report the case of a woman, aged thirty years, who entered the hospital after an illness of ten days. Her abdomen was relaxed and not tender, there was no vaginal discharge, and the bimanual examination was negative. There was no elevation of temperature; in fact, the only symptom was extreme lassitude.

The night after her entrance she began to menstruate, and continued for five days. On the sixth day she had a chill, and subsequently developed obscure septic symptoms, so that a diagnosis of possible septic endometritis was made. A drop of mucus removed from the cervix contained gonococci, whereupon injections of permanganate of potassium were used.

Three weeks after admission periarthritis developed in the left elbow, and a specimen of serum obtained with a hypodermatic syringe was found to contain Neisser's cocci. An incision gave temporary relief; the fever continued, but no other septic foci could be located. Two weeks later septic endo- and pericarditis developed, and the patient died, six weeks after entrance. At the autopsy, pleurisy, endo- and pericarditis were found, the fluid containing numerous gonococci. The pelvic organs were entirely normal.

Curettement in Uterus Bipartitus.—BLONDEL (*La Gynécologie*, April 15, 1898) reports the following interesting case in which it was supposed that the uterus had been perforated by a curette. The patient was curetted on account of menorrhagia, a previous examination having revealed nothing unusual except a slight fulness in the right lateral fornix. The os was patulous, and on introducing a sound the uterine cavity appeared to be slightly enlarged. While gently using the curette, as the instrument was turned toward the right cornu, the uterine wall was felt to yield, and it suddenly penetrated to the depth of an inch. The operation was at once suspended, the cavity of the uterus was irrigated with hot saline solution, and the patient was returned to her bed. No reaction followed, and she was discharged eight days later.

Five months after the curettement was repeated on account of profuse

bleeding, and the curette again penetrated into a cavity at the right cornu. The cervical canal was subsequently dilated with tents, so that the finger could be introduced, when the presence of a diverticulum could be made out, separated from the uterine cavity by a distinct septum. At the lower end of the latter was an opening through which a sound could be passed to the depth of an inch, when its tip encountered a firm wall. A curette was introduced into this cavity, and a specimen of mucous membrane was obtained similar to the hypertrophied endometrium. By the use of an intra-uterine speculum, the orifice leading into the diverticulum could be demonstrated, thus establishing the diagnosis.

The writer adds that uterus bipartitus is such a rare condition that one would not be apt to think of it in connection with curettement, but would rather infer that the curette had perforated the uterine wall instead of entering a diverticulum. It would not be possible to make an exact diagnosis except in the manner adopted in the case reported. It is evident that such an accessory pouch would form an excellent nidus for specific germs, which could be reached and disinfected only with great difficulty.

Treatment of Vesico-vaginal Fistula.—ROUZMINE (*Bolu. Gaz. Botkina; La Gynécologie*, April 15, 1898) analyzes forty-four cases of fistula observed in the hospital at Saratoff among 1004 gynecological cases (4.36 per cent.). This large proportion corresponds with Neugebauer's observations that fistula is relatively most frequent among Russian women, on account of the fact that midwives are rarely employed by the peasants, and hence prolonged labors are common.

As regards the results of operative interference, 47.74 per cent. were cured by a single operation; 6.81 per cent. by two; 18.18 per cent. were relieved by diminishing the size of the fistula; episiocleisis was successful in one instance; eight patients were not relieved. The denuded surface was always quite extensive, and was made so that the edges could be approximated with the least possible tension. Silk sutures were generally used (rarely silver wire), which were removed on the sixth or eighth day. A catheter was left in the bladder for nine or ten days, after which time the patient was allowed to leave her bed. Anæsthesia was rarely used.

Vaginal Hysterectomy with Elastic Ligatures.—STRAUCH (*Med. Obz.; La Gynécologie*, April 15, 1898) describes the following modifications of the usual technique: After separating the bladder and opening the anterior and posterior cul-de-sac, the bladder is protected with a speculum and the uterus is drawn downward (the organ being bisected or morcellated, if necessary), so that an elastic ligature can be passed over each broad ligament. The ligature is tied as tightly as possible, and in its loop is secured a piece of stout silk. It is necessary to leave a large stump in order to prevent slipping. The usual gauze tampon is inserted. The patient is allowed to sit up on the ninth or tenth day, and the gauze and elastic ligatures usually come away at the end of two weeks with the distal ends of the stumps.

The writer has operated by this method in twenty-three cases of benign neoplasms and diseased adnexa without meeting with any complications. It is, of course, not applicable to cases of malignant disease. He no longer re-

moves the diseased tubes and ovaries by the abdominal route, because his results have been so unsatisfactory.

Thyroid Extract in Gynecological Affections.—SACHS (*Kromka Cekarska.; La Gynécologie*, April 15, 1898) used tablets containing four and one-half grains of the extract, one being administered daily at first, the dose being increased to four within a few days. No ill effects were noted. Dysmenorrhœa and hemorrhage were the indications followed, but the results were unsatisfactory. In no instance was any improvement noted in a number of cases.

PÆDIATRICS.

UNDER THE CHARGE OF

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A New Diagnostic Sign of Measles.—KOPLIK (*Medical Record*, April 9, 1898) calls attention anew to a pre-eruptive sign of measles which he first described in 1896 (*Archives of Pediatrics*, December, 1896). Further experience has convinced him of the pathognomonic value of this sign at a time when positive diagnosis of measles is impossible—that is, from seventy-two to twenty-four hours before the appearance of the exanthem of the skin. This phenomenon consists in an eruption of minute bluish-white specks, surrounded by a reddish area upon the mucous membrane of the cheek and lips. These minute specks are but lightly attached to the mucous membrane, and may be rubbed off if the mouth has been washed. In some cases only a few red spots with their central bluish specks are observed; but in other cases the whole lining membrane of cheeks and lips may be covered. As distinguished from other deposits upon the oral mucosa these bluish specks never become white and opaque like sprue spots, nor do they coalesce and become plaque-like in form, but always retain their punctate character.

As the exanthem on the skin appears and spreads, the eruption on the mucous membrane of the cheeks and lips becomes diffuse, and the character of a discrete eruption or spotting disappears, leaving an intense general redness simply dusted over with myriads of the bluish-white specks. When the skin eruption is at its height the buccal eruption begins to fade, and gradually disappears, even while the exanthem is still out. In the later stages of the fading skin eruption the phenomenon is no longer seen.

The great value of this sign of measles lies in the fact that its early appearance in the pre-eruptive stage enables the physician to isolate cases much earlier than has previously been possible, a proceeding that must be of inestimable value in hospitals and institutions where measles epidemics are justly dreaded. In differential diagnosis also this sign is of value in distinguishing

measles from other eruptive diseases and skin diseases resembling it, among which are rötheln, scarlet fever, beginning influenza, forms of erythema multiforme, and some drug eruptions.

This sign can be seen only in very strong daylight falling from a window directly on the mucous membrane. It is necessary to evert the lips and cheeks either with a spatula or the finger.

[We can confirm the existence of this sign in the pre-eruptive stage of many cases of measles, and have come to attach great value to it as an aid to early diagnosis. If detected early it furnishes a most reliable means of distinguishing measles when the early eruption assumes the maculo-papular form so suggestive of variola.]

A Fatal Case of Hemorrhage Under the Scalp in a Newborn Infant.—C. W. TOWNSEND (*Boston Medical and Surgical Journal*, March 3, 1898, p. 207) reported this curious accident in an infant coming under his care at the Boston Lying-in Hospital. After a short first stage of four and one-half hours, and a second stage of two hours and fifteen minutes, the child was delivered with forceps, because of lack of progress and what was thought to be a large caput succedaneum. After the delivery the supposed caput instead of decreasing became larger, and was found to be soft and fluctuating, and was due evidently to an effusion of blood. On the third day it was still larger, extending over the whole cranium. The infant was pale, and its rectal temperature was only 96.8°. On the seventh day the tumor was still increasing, extending over the frontal bones and down the sides of the skull. Death ensued on the tenth day.

At autopsy the body was greatly blanched. A firm blood-clot extended under the scalp and above the periosteum (thus differing from a cephalhæmatoma) over the entire cranium, three-quarters of an inch thick in places. This clot reached from the foramen magnum behind to the middle of the frontal bones anteriorly, and down to the ears on both sides. The child had bled to death under its scalp. It was impossible to find the source of the hemorrhage, but there seemed to be several points of origin. No hemorrhages were found elsewhere.

The Home Modification of Milk.—WESTCOTT (*Archives of Pediatrics*, January, February, 1898) proposes a simple method of calculating the proportions of cream and whole milk required to make any percentage-formula. The essential feature of the method lies in assuming a fixed average percentage of the proteids of mixed cream and milk. In combinations of 12 per cent. cream and milk this factor is taken as 3.90, and for 16 per cent. cream and milk 3.80 is used. Representing the desired percentages of fat and proteids by the symbols F and P, and the total quantity (ounces) of mixture by Q, the quantity of mixed cream and milk is obtained by the proportion

$$3.90 : P :: Q : x.$$

After working out the value of x, the quantity of cream (C) is found by substituting in the formula

$$C = \frac{Q.F - 4x}{8 \text{ or } 12},$$

the denominator of this fraction being 8 or 12 as 12 per cent. or 16 per cent. cream respectively is used. The quantity of milk is at once found by subtracting the value of C thus found from the value of x previously calculated.

The calculation of the amount of sugar of milk to be added is similarly made for any percentage of sugar desired (S) by the formula:

$$\text{Sugar in ounces} = \frac{Q.S - 4.4x}{100}.$$

After the quantities of milk, cream, and sugar are determined, dilution is made up to the total quantity required (Q) by the addition of water, barley-water, or any other chosen diluent.

BANER (*New York Medical Journal*, March 12, 1898) suggests similar methods of calculation, but by neglecting the differences in the proteid values of milk and cream and taking 4 as this common proteid factor, he calculates the quantity of cream required (16 per cent.) by the formula:

$$C = \frac{Q}{12} \times (F - P),$$

[the symbols being the same as in the previous formulæ].

The quantity of milk, then, is expressed by the formula:

$$M = \frac{Q \times P}{4} - C.$$

The quantity of sugar also, by assuming 4 as the percentage of sugar in the milk and cream, is obtained by the formula:

$$\text{Sugar} = \frac{(S - P) \times Q.}{100}$$

[By either of these methods home modification of milk can be accomplished with a considerable degree of accuracy. Westcott's method, like those proposed by Rotch and by Holt, is based upon analyses which have been adopted for laboratory modifications, and its results are very close to those secured by the laboratory. His proteid factor, 3.90, is the average between the 4 per cent. of whole milk and the 3.8 per cent. of 12 per cent. cream, while 3.80 represents the mean between 4 per cent. and the 3.6 per cent. of 16 per cent. cream. Baner's factor, 4, seems rather too high for the ordinary run of milk, and the addition of cream would tend still further to lower it. Whether 4.4 or 4 be taken for the sugar factor is not of great importance, and the integer makes the calculation more expeditious.]

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